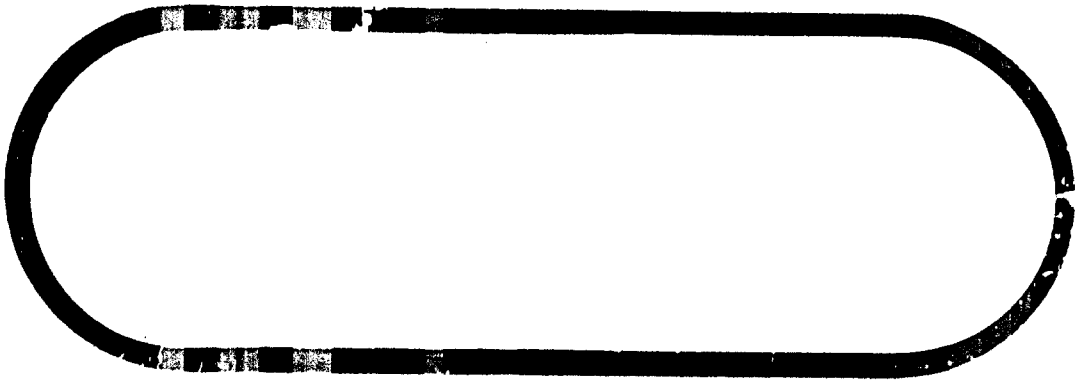
BOEING



SEATTLE, WASHINGTON

BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

PREPARED BY Rick Urban

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SPECIFICATION DOCUMENT NUMBER

TITLE

MODEL(S) WS 133B REVISION DATED 5-3-63

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THIS SPECIFICATION DOCUMENT IS A PART OF SPECIFICATION CONTROL DRAWING

LIST OF ACTIVE PAGES

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TITLE III	P	REV x	G	REV av	H	16	G	40	K	64	K
REV a	A	REV y	G	REV aw	H	17	G	41	K	65	K
REV b	A	REV z	G	REV ax	H	18	G	42	J	66	G
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REV g	A	REV ae	G	INDEX c	G	23	K	47	K	71	L
REV h	B	REV af	G	INDEX d	P	24	G	48	K	72	L
REV i	C	REV ag	G	1	K	25	K	49	L	73	L
REV j	C	REV ah	G	2	K	26	K	50	M	74	L
REV k	C	REV ai	G	3	N	27	K	51	K	75	L
REV l	L	REV aj	G	4	P	28	H	52	K	76	K
REV m	E	REV ak	G	5	-	29	-	53	K	77	K
REV n	E	REV al	-	6	K	30	-	54	K	78	K
REV o	F	REV am	-	7	K	31	-	55	K	79	DELETED K
REV p	F	REV an	-	8	K	32	-	56	G	80	DELETED K
REV q	F	REV ao	G	9	G	33	-	57	G	81	DELETED K
REV r	F	REV ap	G	10	K	34	-	58	-	82	DELETED K
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SPECIFICATION DOCUMENT PAGE

LIST OF ACTIVE PAGES

Page Number	Rev. Letter	Page Number	Rev. Letter	Page Number	Rev. Letter	Page Number	Rev. Letter	Page Number	Rev. Letter	Page Number	Rev. Letter
83c	K	109a	[illegible]	136	G	163	K				
84	G	110	[illegible]	137	G	164	H				
85	[illegible]	111	[illegible]	138	G	165	[illegible]				
86	K	112	[illegible]	139	[illegible]	166	[illegible]				
87	G	113	[illegible]	140	G	ba	[illegible]				
88	K	114	[illegible]	141	G	bb	[illegible]				
89	K	115	[illegible]	142	G	bc	K				
90	L	116	[illegible]	143	G	bd	K				
91	L	117	[illegible]	144	[illegible]	be	K				
92	[illegible]	118	[illegible]	145	[illegible]	bf	L				
93	[illegible]	119	K	146	[illegible]	91a	L				
94	[illegible]	120	[illegible]	147	G	bg	M				
95	[illegible]	121	H	148	[illegible]	bh	N				
96	P	122	H	149	[illegible]	b[illegible]	NEW P				
97	K	123	[illegible]	150	[illegible]	[illegible]	NEW P				
98	J	124	[illegible]	151	[illegible]	32b	NEW P				
99	[illegible]	125	[illegible]	152	[illegible]	111a	NEW P				
100	H	126	H	153	K						
101	H	127	[illegible]	154	M						
102	G	128	[illegible]	155	M						
103	H	129	[illegible]	156	[illegible]						
104	[illegible]	130	[illegible]	157	[illegible]						
105	[illegible]	131	[illegible]	158	[illegible]						
106	K	132	[illegible]	159	K						
107	H	133	[illegible]	160	K						
108	[illegible]	134	[illegible]	161	G						
109	H	135	[illegible]	162	[illegible]						

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REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									

A Title Page II: Revised List of Active Pages

See page Rev. g

Page Revision a,b,c,d,e,f,g: Added new pages for revisions.
Page Index C: Revised titles of Figures 3 thru 5, 8 thru 10 and added new Figures 15, 16 and 17 to index.
Page 3, Paragraph 2.1.1, changed reference to read "MIL-E-4970A" dated "3 March 1959" in lieu of "MIL-E-4970" dated "1 June 1955." (Superceded).. Deleted reference to MIL-E-6181B.
Page 4, Paragraph 2.1.3, Deleted reference to AF Bulletin 67B. (Cancelled).
Page 4, Paragraph 2.2.1, Deleted reference to DM-1011, added reference to D2-4123.
Page 5, Paragraph 3.1.1.1.2.1, Critical Materials, deleted all.
Page 7, Paragraph 3.1.1.1.10, Revised to read "All case protrusions" in lieu of "all connectors and other case protrusions."
Page 7a, Paragraph 3.1.1.1.11, Added sentence "Weight economy is etc."
Page 8, Paragraph 3.1.1.2.6, Re-written to detail grounding requirements.
Page 11, Paragraph 3.1.1.5.2, Last sentence, deleted all after vendor.
Page 12, Paragraph 3.1.2.1.1, Re-written to provide more detailed information about cooling.
Page 12, Paragraph 3.1.2.1.3, Re-written to provide more detailed information about power source. Added requirement for secondary power supply and converter short circuit protection.
Page 13, Paragraph 3.1.2.1.11, Deleted first sentence.
Page 13, Paragraph 3.1.2.1.12 Changed to read "ground power supplies" in lieu of "auxiliary power supplies." "Accept" in lieu of "limit""
Page 14, Paragraph 3.1.2.2.5, changed to read "below the unmodulated carrier level" in lieu of "down from the carrier level".
Page 15, Paragraph 3.1.2.2.9 (Cont'd)., Revised first sentence "The RF section etc.", Added last sentence "The deviation shall, etc."
Page 17, Paragraph 3.2.1.2.2, Deleted second sentence.
Page 17, New paragraph 3.2.1.2.3, added to detail grounding requirements.
Page 22, Paragraph 3.2.2.1.4.3, Added sentence to clarify requirements.

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
A	Page 23, Paragraph 3.2.2.2.4, Added lower limit of minus 0.1 volts to negative potential. Page 25, New paragraph 3.3.1.2.3, added to reference paragraph 3.2.1.2.3 for grounding requirements. Page 28, Paragraph 3.3.2.1.2, Replaced "(0-5v)" and "(0-50mv)" with "(0 to + 5 volts)" and "(0 to +50 millivolts)" respectively, all places. Page 28, Paragraph 3.3.2.1.2 Replaced (a) (b) and (c) to read, "Any combination of, etc." Page 29, Paragraph 3.3.2.1.7, deleted all, reference made to paragraph 3.1.2.1.1 for cooling. Page 30, Paragraph 3.3.2.2.2, Added maximum expected common mode potential. Changed "now" to "nor" Page 32, Paragraph 3.4.1.3.2.1, Added new sentence "The ambient temperature on the ground is 110°F". Page 33, Paragraph 3.4.2.1, Replaced "(0-5v)" and "(0-50mv)" with "(0 to +5 volts)" and "(0 to +50 millivolts)" respectively, all places. Replaced (a) (b) and (c) to read, "Any combination of, etc." Page 33, Paragraph 3.4.2.3, Added more detailed information about cooling. Page 34, Paragraph 3.5.1.1.3, Deleted words "amplifier" and "amplifiers". Page 36, Paragraph 3.5.1.2.3, Electrical Code Compliance, deleted all. Page 40, Paragraph 3.5.2.1.6, Added definition of operation life. Page 42, Paragraph 4.1.2.2, Last sentence, deleted "at no additional cost to the buyer" Page 44, Paragraph 4.3.1.3, Re-written to reference new Figure 8 for Acceptance Test vibration envelope. Page 44, Paragraph 4.3.2.1, Wording changed for clarification Page 46, Paragraph 4.3.4.1, Re-written to reference new vibration Figures 15 and 8 in lieu of specifying r.m.s. Page 47, Paragraph 4.5.1, Re-written to clarify the number of test units required. Added sentence: "Each test article etc." Page 47, Paragraph 4.5.1.2, Changed to reference Figures 4 and 5, in lieu of Figures 9 and 10. Page 48, Paragraph 4.5.1.4, Re-written to detail the temperature-altitude test. Page 48a, Added page for completion of temperature-altitude requirements. Page 49, Paragraph 4.5.1.4.1, Changed to 4.5.1.4.3 to compensate for addition of paragraphs 4.5.1.4.1 and 4.5.1.4.2. Page 49, Paragraph 4.5.1.6, Re-written to detail the Interference Test required.										

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED MCR NO. DRAWN CHECKED STRESS APPROVED REL/E-P REL DATE
A	Page 49, Paragraph 4.5.1.7 moved from page 49 to Page 50 due to re-writing paragraph 4.5.1.6. Page 50, Paragraph 4.5.1.7, Re-written for clarification, reference made to Figures 9 and 10 for vibration requirements in lieu of specifying vibration amplitudes. Page 51, Paragraph 4.5.2, Re-written to clarify the number of test units required. Page 51a, New Page added due to re-writing paragraph 4.5.2. Page 53, Paragraph 4.5.2.5.2, Re-written to detail the temperature-altitude test. Page 54, Paragraph 4.5.2.5.3, Re-written to detail the temperature-altitude test. Page 55, Paragraph 4.5.2.7, Re-written to detail the Interference Tests required. Page 55, Paragraph 4.5.2.8 moved from page 55 to 56 due to re-writing paragraph 4.5.2.7. Page 56, Section 4.5.2.8, Re-written for clarification, reference made to Figures 9 and 10 for vibration requirements in lieu of specifying vibration amplitudes. Page 56a, New page added due to re-writing paragraphs 4.5.2.7 and 4.5.2.8, and due to new paragraph 4.5.2.9. Page 56b, Section 4.5.2.8 (Cont'd) re-written due to rewriting section 4.5.2.8. Page 56a, New paragraph 4.5.2.9 added for Shock Test requirements. Page 57, Paragraph 4.5.3, Deleted "acceleration" added "shock". Page 57, Paragraph 4.5.3.1, Re-written to reference Figure 3 for vibration requirements in lieu of specifying vibration amplitudes. Page 58, Paragraph 4.5.3.2.2, Changed to read "MIL-E-4970A" and "procedure IV" in lieu of "MIL-E-4970" and "procedure VI". Revised to read: "While unpackaged, etc." Page 61, New Paragraph 4.7.3 added for Evidence of Acceptance Test. Page 65, Paragraph 6.1.1.2, Re-written to clarify intended use. Page 65, Paragraph 6.1.1.4, Added new paragraph to read "Failure of the RF Section, etc." Page 65a, New Page added due to additional paragraph 6.1.2.3. Page 66, Paragraph 6.2.1, Reference made to D2-4123 for Design Proposal Approval, in lieu of paragraph 6.4.3. Page 70, Paragraph 6.3.10, Revised definition of reliability. Page 73, Paragraph 6.4.3.1.3, Proposal Revisions requirements, deleted all. Page 73, Paragraph 6.4.3.1.5, Quotation Program Schedule requirements, deleted all. Page 74, Section 6.4.3.2, Deleted all specific exhibits listed, reference made to D2-4123 for specific exhibits required.	See page Rev. g

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
A	Page 76, Paragraph 6.4.4.3, Installation and Maintenance Instructions requirements, deleted all. Page 81, Paragraph 6.6.1, Request for Quotation re-worded. Page 81, Paragraph 6.6.2, Reference made to D2-4123 in lieu of paragraph 6.4.3, paragraph re-worded. Page 81, Paragraph 6.6.3, Deleted last sentence. Page 81, Paragraph 6.6.4, Firm Quotation, deleted all. Page 81, Paragraph 6.6.5, Purchase Order, re-worded. Page 82, Paragraph 6.6.7, Added (e) "Interference Control" etc. Page 90, Figure 4, Re-drawn to show design requirements of 5g in lieu of anticipated flight vibration of 3g rms. Page 91, Figure 5, Re-drawn to show design requirements of 0.1 g^2 cps 5-1000 cps, with 12 db roll-off to 2000 cps, in lieu of anticipated flight vibration of 0.03 g^2/cps 5-25 cps, and 0.1 g^2/cps 5-2000 cps Page 93, Fig. 7, Re-drawn to show 0.2 g^2/cps 5-1000cps roll-off to 2000cps. Page 94, Figure 8, Orginal vibration envelope deleted. Replaced with new Figure 8 for Instrumentation Compartment equipment acceptance test vibration envelopes Reason for Change: Clarification of specification. Page 31, Paragraphs 3.4.1.3.1 and 3.4.1.3.2 changed to read "section 3.4.2" in lieu of "section 3.4.2.2" Page 37, Paragraph 3.5.1.3, Changed to read "3.5.2" in lieu of "3.5.2.2." Page 37, Paragraph 3.5.1.3.1.2, Vibration, deleted all. Page 37, Paragraph 3.5.1.3.1.4, Shock, deleted all. Page 89, Figure 3, Re-drawn to show 5g peak in lieu of 3.5g and 2g peak in lieu of 1.5g. Page 92, Figure 6, Re-drawn to shown 7g peak in lieu of 5g. Page 95, Figure 9, Re-drawn to show 4g peak in lieu of 3g. Title changed to read "envelope for reliability tests", in lieu of "test envelope for equipment operative(instrumentation compartment)." Page 98, Figure 12, Replaced "0.5 micro sec. max." with "5.0 micro sec. max." Reason for Change: Engineering Error. Title Page I: Added Reliability Group signature. Page 3, Paragraph 2.1.1, Added reference to MIL-S-5400C & MIL-F-14072. Page 3a, New Page added. Reference to MIL-C-25050 added. Page 3a, Paragraph 2.1.2 moved from page 3, added reference to FED-STD-595. Page 4a, Paragraph 2.2.3 added to reference assigned frequency for transmitter. Page 4, Paragraph 2.1.4, Deleted reference to AS33586 for use of metals.	See page Rev. g									

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A	Page 4, Paragraph 2.2.1, Added reference to BMS 10-26 and to BAC 5306. Page 4a, New page added due to addition of reference above. Page 6, Paragraph 3.1.1.1.2.3, Deleted requirement for use of metals to be in accord with MS 33586. Page 6, Paragraph 3.1.1.1.2.3.1, New paragraph added for similar and Dissimilar metals. Page 6, Paragraph 3.1.1.1.4, Revised paragraph heading to read "Maintainability" in lieu of "Maintenance Convenience", added sentence "Maintainability shall be considered,"etc. Page 7, Paragraph 3.1.1.1.7, Added requirement for drainage provisions if unit is not sealed, paragraph re-worded for clarification. Page 7, Paragraph 3.1.1.1.9.3, Revised to require test points to monitor the output voltage of the phase detector. Page 8, Paragraph 3.1.1.2.3, Deleted "King Electronics". Changed "common" to "cannon" Page 8a, New page added due to re-writing 3.1.1.2.6. Page 8a, Paragraph 3.1.1.2.7 moved from page 8 due to re-writing 3.1.1.2.6. Page 9, Paragraph 3.1.1.3.1.5.1, Added paragraph to clarify packaging in the environment specified. Page 9, Paragraph 3.1.1.3.1.6, Added reference to 3.1.1.3.1.5.1. Page 9, Paragraph 3.1.1.3.1.7, Added reference to 3.1.1.1.2.2 and 3.1.1.3.1.5.1. Page 10, Paragraph 3.1.1.3.2.5, Revised to read "15g" in lieu of "10g". Page 13, Paragraph 3.1.2.1.9, Added feedback current limitation. Page 13, Para. 3.1.2.1.10.3, Changed tolerance to read "±3%" in lieu of "±1%". Page 13, Paragraph 3.1.2.1.10.4, Changed rise time to 0.1 to 0.3 microseconds in lieu of 1 to 1.5 microseconds, changed fall time to 0.3 to 0.7 microseconds in lieu of 1 to 1.5 microseconds. Page 14, Paragraph 3.1.2.2.2, Deleted. Page 14, Paragraph 3.1.2.2.3, Re-written to add adjustment requirement. Page 14, Paragraph 3.1.2.2.5, Revised to require 102db down from carrier level for allocated receiver passbands and added sentence "Should a filter be required, etc." Page 14, Paragraph 3.1.2.2.7, Revised second sentence to read: "The center frequency's specified, etc." Page 21, Paragraph 3.2.1.4.1, Added "or four, etc." Page 14, Paragraph 3.1.2.2.8, Revised to read "18 db/octave in lieu of "16 db/octave"; Added sentence "The vendor will be, etc." Page 16, Section 3.2, Added sentence to allow for multiplexer requirement in programmer.										

See page Rev. g

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
A	Page 16, Paragraph 3.2.1.1, Added paragraph 3.1.1.1.10 to exceptions. Page 16, Paragraph 3.2.1.1.1, Revised paragraph heading to read "Maintainability" in lieu of "Maintenance Convenience", added sentence "Maintainability shall be considered", added multiplexer card requirement. Page 16a, New paragraph 3.2.1.1.5 added for Physical Size. Page 16a, New page added for 3.2.1.1.4.4 due to rewriting 3.2.1.1.1. Page 17, Paragraph 3.2.1.2, Added 3.1.1.2.6 to exceptions. Page 17, Paragraph 3.2.1.2.1, Electrical Connectors, revised to require pigtails in lieu of connectors. Page 17, Paragraph 3.2.1.2.1, Deleted "epoxy resin per MIL-1-16923C", added "the type of sealant, etc." Page 18, Paragraph 3.2.1.4, Added "with the exception that, etc." Page 19, Paragraph 3.2.2.1.1, Changed section to allow for multiplexer capability. Page 19a, New page to allow for multiplexer addition. Paragraph 3.2.2.1.1.2 added "or four multiplexers, etc." Page 22, Paragraph 3.2.2.1.6, Added requirement for secondary power supply and connector short circuit protection, reference added to paragraph 3.1.2.1.3 for source impedance. Added "or four" etc. Page 22, Paragraph 3.2.2.1.7, Added feedback current limitation. Page 23a, Added new page for Detail Requirements of Multiplexer function of 10-20402-1. Page 24, Paragraph 3.3.1.1, Added paragraph 3.1.1.1.10 to exceptions. Page 24, Paragraph 3.3.1.1.1, Revised paragraph heading to read "Maintainability" in lieu of "Maintenance Convenience," added sentence "Maintainability shall be considered", etc. Page 24, Paragraph 3.3.1.1.5, New paragraph added for Physical Size. Page 25, Paragraph 3.3.1.2, Added 3.1.1.2.6. Page 26a, New page added due to revising 3.3.2.1.2. Page 31, Paragraph 3.4.1.2, Changed "3.1.1.2.3" to read 3.1.1.2.6 and 3.1.1.2.7. Page 31, New paragraph 3.4.1.2.4 added to reference paragraph 3.2.1.2.2 for bonding requirements. Page 32, Paragraph 3.4.1.3.2.5, Changed to read "15g" in lieu of 10g. Page 34, Paragraph 3.5.1.1.1, Revised paragraph heading to read "Maintainability" in lieu of "Maintenance Convenience", added sentence "Maintainability shall be considered", etc. Page 34, Paragraph 3.5.1.1.5 "Physical Size and Weight" moved to page 34a due to rewritting of the paragraph. Page 31, New Paragraph 3.4.1.2.3 added to reference paragraph 3.2.1.2.3 for grounding requirements.										

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REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV	W.G. FREDERICK	9500	Gene H. Scrogenfrei R. Urban				
A	Page 34a, Page added to include revision, Paragraph 3.5.1.1.5 Revised space and weight requirements for clarification. Page 35, Paragraph 3.5.1.1.6, Revised finish requirements to be in accordance with D2-4051 in lieu of MIL-E-4156. Changed color number to be 36492 in lieu of 26329. Added color number 34300 and type TT-E-527 enamel. Page 35, New paragraph 3.5.1.1.6.1 added to reference MIL-F-14072 for use of dissimilar metals. Page 35, New paragraph 3.5.1.1.7 added to reference MIL-E-4156B for safety requirements. Page 36, New paragraph 3.5.1.2.4 added for grounding requirements. Page 38, New section 3.5.1.5 added for Human Factors requirements. Page 38a, New page added for continuation of section 3.5.1.5. Page 50a, New page added for new Shock Test paragraph. Page 54, Paragraph 4.5.2.5.3, Deleted. Page 56, Paragraph 4.5.3.2.1, Free Drop Test, deleted all. Page 96, Figure 10, Re-drawn to show $0.03g^2$/cps 5-25 cps, $0.1g^2$/cps 25-1000 cps with 12 db roll-off to 2000 cps in lieu of $0.1g^2$/cps 5-1000 cps with roll-off to 0.025 g^2/cps at 2000 cps. Title changed "envelope for reliability tests" in lieu of "test envelope for equipment operative (instrumentation compartment)." Page 99, Figure 13, Representative waveform for digital output complex to RF section revised to show a rise time of 0.1 to 0.3 microseconds and a fall time of 0.3 to 0.7 microseconds. Page 100a, New Figure 15 added for Interstage equipment Acceptance Test vibration envelope. Page 100b, New Figure 16 added for Shock Test Spectrum. Page 100c, New Figure 17 for Temperature-Altitude Tests. Reason for Change: Completion of basic design. Revision A change Effective: R&D Missiles 003,004 and on.								

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	WS-133A	D10-20402	REV. A

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	APPROVED	REL/D-P	REL DATE
B	Page Revision h added Page Index "a", added paragraph 3.6 for design of sled transmitter and paragraph 4.5.4 for (qualification) test of sled transmitter. Page Index "c" added Figure 18 to index. Page 1, Section 1 added sled transmitter to scope of the specification. Page 2, Paragraph 1.3 added paragraph to complete scope of sled transmitter specification. Page 3, Added MIL-E-005272B to Government Documents. Page 46a, Page added to include revision. paragraph 4.3.6, "Individual tests for 10-20402-5". Page 47, Changed paragraph 4.3.6 to 4.3.7 due to addition of sled transmitter test requirements. Page 47, Paragraph 4.5.1, added paragraph 4.5.1.6.1 to exceptions. Page 58, Paragraph 4.5.4. Preproduction test as applicable to sled transmitter. Page 58a, New page added to complete sled transmitter qualification tests. Page 65a, Paragraph 6.1.3, added paragraph to show intended use of sled transmitter. Page 40a, Added page to include Sled transmitter design requirements. Page 40b, Added page to include sled transmitter, electrical requirements and environmental conditions. Page 40c, Added page to include sled transmitter reliability requirements. Page 40d, Added page to include sled transmitter detailed requirements. Page 40e, Added page for continuation of detailed requirements for sled transmitter. Page 40f, Added page for completion of detailed requirements for the sled transmitter. Page 40g, Added page to include sled transmitter primary power variation requirement. Page 100d, New Figure 18 for Holloman AFB test sled for PCM/FM telemetry. Reason for Change: Procure parts for Downey & Holloman Integration Tests. Revision B Change effective: R&D sled tests Downey-HollomanAFB Page 14, Paragraph 3.1.2.2.3, Changed to read "17 watts" in lieu of "15 watts". (PRR 9500) Page 17, Paragraph 3.2.1.2.3, Deleted "Individual signal, power and". (PRR 9500) Page 50, Paragraph 4.5.1.6.1 added new paragraph for addition cross-modulation test requirement. (PRR 9500) Reason for Change: Completion of basic design. Revision B Change effective: R&D Missiles 003,004 and on.	VAR	W.G. FREDERICK T.M. 28 & PRR 9500	Geo. H. Sergeant R. URBAN	9-8-59 9-16-59 10-9-59					

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REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	ALL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									

C Title Page II Revised list of active pages
Title Page III New Page added for additional specification pages

Page Revision i,j,k : Add new pages for revisions
Page Index a, added section 3.7 for -6 requirements, deleted -3 requirements.

Page 1, Paragraph 1.1.3, Deleted -3 from scope. (PRR 9500)
Page 2, Paragraph 1.4, Added multiplexer system (-6) to scope (PRR 9500)
Page 4a, Paragraph 2.2.3, Referenced date and added "2-4446.-8-364" in lieu of "2.4446.8-345" (PRR 9500)
Page 3a, Paragraph 2.1.2, Revised MIL-STD-12b in lieu of -12A (PRR 9500)
Page 10, Paragraph 3.1.1.4.1, Revised to include Reliability of complete telemetry system (PRR 9500)
Page 16, Section 3.2, Deleted multiplexer function from programmer.
Page 16, Paragraph 3.2.1.1.1, Deleted reference to multiplexer function.
Page 16a, Paragraph 3.2.1.1.5, Deleted last sentence (PRR 9500)
Page 17, Paragraph 3.2.1.2.1, Revised connection requirements (PRR 9500)
Page 18, Paragraph 3.2.1.4 Removed reliability requirement for the multiplexer function of programmer
Page 19, Paragraph 3.2.2.1.1, Revised logic requirement for channel "b"
Page 19a, Paragraph 3.2.2.1.1.2, Deleted "The three or four"
Page 21, Paragraph 3.2.2.1.4.1, Deleted "three or four" and "(as required)"
Page 22, Paragraph 3.2.2.1.6, Deleted "three or four"
Page 22, Paragraph 3.2.2.1.4.3, Added ". . .1% for 0 to plus 10 mv channels (PRR 9500)
Page 23, Paragraph 3.2.2.2.2, Added 0 to + 10 mv accuracy (PRR 9500)
Page 23a, Paragraph 3.2.2.3, Deleted multiplexer requirements for the programmer
Page 24, Paragraph 3.3. . . , Revised to -100 cards in lieu of -10 cards (PRR 9500)
Page 27, Paragraph 3.3.1.4, Deleted last sentence (PRR 9500)
Page 28, Paragraph 3.3.2.1.2, Revised to increase capacity of multiplexer -2
Page 29, Paragraph 3.3.2.1.6.1, Revised sampling rate to 16,00 sps total.
Page 16, Paragraph 3.2.1.1.2, Deleted reference to multiplexer function.

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	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
C	Page 30, Paragraph 3.3.2.2.8, Revised to include 0 to + 10mv channels. (PRR 9500) Page 30, Paragraph 3.3.2.2.6, Included 0 to +10mv feed back requirement. (PRR 9500) Page 30, Paragraph 3.3.2.2.7.2, Revised to "0 to + 10 mv" in lieu of "low level". (PRR 9500) Pages 31,32,33, Deleted Design Requirements for 10-20402-3 (PRR 9500) Page 34, Paragraph 3.5.1.1, Added paragraph 3.1.1.1.5 to exception. (PRR 9500) Page 34a, Paragraph 3.5.1.1.6, Added new paragraph to delete D5-2300 requirement. (PRR 9500) Page 40h, Page added for Design Requirements of 10-20402-6 (PRR 9500) Page 40i, Page added for General Requirements of 10-20402-6 (PRR 9500) Page 40 j, Page added for detail requirements of 10-20402-6 (PRR 9500) Page 40k, Page added for completion of requirements for 10-20402-6 (PRR 9500) Page 44, Paragraph 4.3.2.1, Revised second paragraph to include "-6" in lieu of "-3" (PRR 9500) Page 45, Paragraph 4.3.4, Revised to ". . . tests for 10-20402-6" in lieu of ". . . 10-20402-3" (PRR 9500) Page 46, Paragraph 4.3.4.1, Revised to include "-6" in lieu of "-3" (PRR 9500) Page 47, Paragraph 4.3.7, Added ". . . -6" deleted ". . . -3" (PRR 9500) Page 47, Paragraph 4.4.1, Added " . . -6" deleted " . . -3" (PRR 9500) Page 48, Paragraph 4.5.1.4.2, Revised to include -6 system in lieu of -3. (PRR 9500) Page 51, Paragraph 4.5.2, Revised paragraph to include -6 system in lieu of -3 multiplexer. (PRR 9500) Page 52, Paragraph 4.5.2.3.2, Revised to include -6 system in lieu of -3 multiplexer. (PRR 9500) Page 53, Paragraph 4.5.2.4.1, Revised to include -6 system in lieu of -3 multiplexer. (PRR 9500) Page 53, Paragraph 4.5.2.5.2, Revised to include -6 system in lieu of -3 multiplexer. (PRR 9500) Page 56, Paragraph 4.5.2.8, Deleted (PRR 9500) Page 56a, Paragraph 4.5.2.8, Deleted (PRR 9500) Page 50, Paragraph 4.5.1.7, Revised reliability tests to include complete telemetry system. (PRR 9500) Page 50a, Paragraph 4.5.1.7, Revised for new reliability tests. (PRR 9500) Page 58, Paragraph 4.5.4.4, Revised temp.-alt. test (PRR 9500) Page 58a, Paragraph 4.5.4.4, Revised to include new temp.-alt. test. (PRR 9500) Page 47, Paragraph 4.5.1 Deleted paragraph 4.5.1.7 from exceptions. CON'T									

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED		APPROVED	REL/B-P	REL DATE
C	Page 60, Paragraph 4.6.2, Added "-6", deleted "-3". (PRR 9500) Page 65, Paragraph 6.1.1.2, Revised fourth sentence to read "The multiplexer system . . ." in lieu of "The multiplexer -3". (PRR 9500) Page 65, Paragraph 6.1.1.4, Added "multiplexer system (-6)" -7 and -8 for intended use. Deleted "-3". (PRR 9500) Page 97, Figure 11, Revised test diagram to include -6 systems in lieu of -3 units. (PRR 9500) Page 100c, Figure 17, Revised Temp.-Alt. test set-up to include two -6 systems. (PRR 9500) Page 101, Revised to include -6 logic in lieu of -3 logic. (PRR 9500) Reason for Change: Completion of Basic Design Revision C Change Effective: R&D Missiles 003,004 and on.	DEV	W.G. FREDERICK	TM 52 & PRR 9500	G. SORGENFREI	R.W.	9/1/59	W.A. Fredrick 9/2	179	

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REVISION

FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.

	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
D Title Page I, II, III Revised list of active pages. Page Revision L New Revision Page added Page 12, Paragraph 3.1.2.1.3, Revised to include ripple requirement. Page 13, Paragraph 3.1.2.1.12, Revised transient potential to 28 ± 12 volts in lieu of twice the nominal primary potential. Page 22, Paragraph 3.2.2.1.6, Deleted second sentence, referred grounding requirements to paragraph 3.1.2.1.3 **Reason for Change:** Clarification of Specification (PRR 9500) Page 78a, Paragraph 6.4.6, Added new page for photographic requirements Page 4a, Added D2-4751 to Publications **Reason for Change:** Air Force request per TM 49.	VAR	W.G. FREDERICK	PRR 9500 & TM 49	G. SORGENFREI	[illegible]		W.A. [illegible] 10/9/59	[illegible]	10-[illegible]-59

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REV LTR	REVISION	DEV/VAR REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.								
E	Title Page I, II, III, Revised list of active pages.	See Rev. m							

Rev. M,N Added new pages for revisions.
Page 8, Paragraph 3.1.1.2.3, Revised last sentence.
Page 8a, Paragraph 3.1.1.2.7, Last sentence revised to "may" in lieu of "shall"
Page 9, Paragraph 3.1.1.3.1, Revised to include "out of shipping container".
Page 9, Paragraph 3.1.1.3.1.4, Deleted "as encountered in shipment of packaged equipment".
Page 9, Revised non-operative environmental conditions to 35,000 ft. and -65°F in lieu of 50,000 ft. and -80°F.
Page 10, Paragraph 3.1.1.3.2.6, Revised to include "RMS.... overall (37 1/2 - 4800 cps) Random".
Page 12, Paragraph 3.1.2.1.1, Revised to include "36 consecutive hours" in lieu of "indefinite period".
Page 17, Paragraph 3.2.1.2.3, Revised shield grounding requirements.
Page 22, Paragraph 3.2.2.1.4.4, Added tolerance ± 10%.
Page 35, Paragraph 3.5.1.1.6, Revised paint specifications.
Page 40a, Paragraph 3.6.1.1.1, Revised Heat Sink Requirements on sled transmitter.
Page 40e, Paragraph 3.5.2.1.1.2, Revised transient potentials
Page 40j, Paragraph 3.7.1.3.2.6, Revised to include "RMS.... (37 1/2-4800 cps) Random".
Page 44, Paragraph 4.3.1.3, Added "upwards or.....etc."
Page 46a, Paragraph 4.3.6.3, Added "upwards or.....etc."
Page 47, Paragraph 4.5.1.2, Revised third sentence to contain sweep definition.
Page 48, Paragraph 4.5.1.3, Added "15g min. i.e. at the point of connection to the centrifuge".
Page 48 Revised non-operative conditions to 35,000 ft. and -65°F in lieu of 50,000 ft. and -80°F
Page 48a Paragraph 4.5.1.4.2, Added note to include option of one -6 system in test chamber.
Page 50a, Paragraph 4.5.2.5.2, Restated test requirements. No test required, and deleted note.
Page 52, Paragraph 4.5.2.3.2, Revised third sentence to contain sweep definition.
Page 53, Paragraph 4.5.2.5.2, Restated test requirements. No test required, and deleted note.
Page 53, Revised non-operative conditions to 35,000ft. and -65°F in lieu of 50,000 ft. and -80°F.para. 4.5.2.5.1
Page 71, Paragraph 6.3.17, Revised power distribution of programmer.
Page 89, 90, 91, 92, 93, 94, 95, 100a - Added tolerance to vibration envelopes.
Page 58, Para. 4.5.4.4, Revised to 35,000 ft. and -65°F.
Page 40k, Para. 3.7.2.3, Revised "indefinite" to "3/ etc."

Reason for Change: Clarification of specification. (PRR 9500)

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
E	CONT'T Page 1, Paragraph 1.1.2, Revised to show power for -2 only. Page 22, Paragraph 3.2.2.1.6, Revised to allow converters for -2 only, in programmer. Page 39 Revised to include power to -6 system. Page 39a, Added new page due to revising of previous page. Page 40K, Paragraph 3.7.2.4, Added Power requirements for -6 system. Page 97, Revised Test Diagram **Reason for Change:** Completion of Basic Design (PRR 1105) **Revision E Change Effective:** R & D Missiles 003,004 and on.	VARIATION	W.G. FREDERICK	PRR1105 #95CO	G. Sargentrei CP			11-1-57		

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SEATTLE 24, WASHINGTON

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(F)	Title Page I, II, III: Revised list of Active Pages Page Rev. O, P, Q, R, S, T, U, V, W Added to include Rev. F. Page 2, Paragraph 1.3 Re-written to amplify description of the -5 Transmitter by defining a-9 Exciter Unit, a-10 Attenuator, Multiplier, Amplifier Unit and a -11 power supply. Page 2, New Paragraph 1.3.1 added for -9 Exciter Unit of the -5 Transmitter System Page 2, New Paragraph 1.3.2 added for -10 Attenuator, Multiplier, Amplifier Unit of the -5 Transmitter System Page 2, New paragraph 1.3.3 added for -11 Power Supply Unit of the -5 Transmitter System Page 6, Paragraph 3.1.1.1.4 Deleted "and with a maximum of 10 bolts or screws". Page 7, Paragraph 3.1.1.1.9.3 Deleted Page 7, Paragraph 3.1.1.1.7, Revised to allow use of RF mounting surface for heat sink during bench operation. Page 8, Paragraph 3.1.1.2.6 Transmitter-power amplifier-added "Modulation" between words "all" and "signal". Page 9, Revised altitude and Temperature Requirements to 20,000 ft. and -45°F. Paragraph 3.1.1.3.1.1 Page 12, Paragraph 3.1.2.1.1, Revised to allow external cooling during bench operation. Deleted sentence relative to approximation of mounting surface temperature. Page 13, Paragraph 3.1.2.1.6 Deleted Page 13, Paragraph 3.1.2.1.10.4, Revised rise and fall time to be 0.3 ± 0.1 micro seconds in lieu of rise time of 0.1 to 0.3 micro seconds and fall time of 0.3 to 0.7 microseconds. Page 14 Paragraph 3.1.2.2.3 Clarified VSWR requirement. Page 14, New paragraph 3.1.2.2.3.1 Added requirement for VSWR 5:1. Page 14, Paragraph 3.1.2.2.7 revised Definition of Center Frequency. Page 14a, Continued paragraph 3.1.2.2.7 revision. Page 14a, Deleted requirement that vendor be required to conduct tests to determine optimum filter to minimize RF bandwidth and preserve coded data. Para. 3.1.2.2.8 Page 15, Paragraph 3.1.2.2.9 Added tolerance to deviation sensitivity. Page 10, Paragraph 3.1.1.4.1 Deleted "RF Section" and reduced reliability requirement from .995 to .994. Page 14, Paragraph 3.1.2.25, revised receiver passband from 4.9 -5.1 Kmc to 4.9 - 5.7 Kmc.	See Rev. Page Y

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(F)	Page 40a, Paragraph 3.6 re-written to define -9, -10, -11 units as being part of the -5 transmitter system. Page 40a, Paragraph 3.6.1.1.1, deleted requirement that internal components not be exposed thru the removal of insulation skin. Page 40a, Paragraph 3.6.1.1.2, deleted requirement that not over 10% of tube circuits may contain trimming adjustments, and requirement for no necessity of adjustment after replacement. Page 40a, Paragraph 3.6.1.1.3, Changed to read "transmitter system" in lieu of "transmitter". (two places) Page 40a, Paragraph 3.6.1.1.3.1, revised to read "heater voltage, and plate voltage, in lieu of "output power, frequency and waveform". Page 40a, Paragraph 3.6.1.1.3.2, Deleeted. Page 40b, Paragraph 3.6.1.2, Changed to read "3.1.1.2.3" in lieu of "3.1.1.2.6". Page 40b, Paragraph 3.6.1.2.1, Grounding, deleted. Page 40b, Paragraph 3.6.1.2.2 Deleted sentence "Part numbers of modified connectors will be specified at a later date" Page 40b, Paragraph 3.6.1.3.2.1 Changed to read "-10°C to +70°C" in lieu of "as high as 160°F" Page 40d, Paragraph 3.6.2.1, Deleted requirement in regard to production variations etc. Page 40d, Paragraph 3.6.2.1.2, changed toread "transmitter syste " in lieu of "transmitter". Page 40d, Paragraph 3.6.2.1.3, Changed max. power drain to read "12 amperes" in lieu of "10 amperes", "transmitter system" in lieu of "transmitter". (2 places) Page 40d, Paragraph 3.6.2.1.4 Delete "Such adjustments--- components" Page 40d, Paragraph 3.6.2.1.5, Changed to read "Exciter" in lieu of "transmitter". Page 40d, Paragraph 3.6.2.1.6. Deleted. Page 40d, Paragraph 3.6.2.1.7, Changed to read "transmitter system" in lieu of "transmitter". Page 40e, Paragraph 3.6.2.1.8, Changed to read "transmitter system" in lieu of "transmitter". Page 40e, Paragraph 3.6.2.1.9, Changed to read "system" in lieu of "unit", specified requirement applicable to the -9 and -11 units.										

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(F) Page 40e, Paragraph 3.6.2.1.10, Changed to read "transmitter system" in lieu of "transmitter".

Page 40e, Paragraph 3.6.2.1.10.4, Revised rise and fall time to be 0.3 ± 0.1 microseconds in lieu of rise time of 0.1 to 0.3 microseconds and fall time of 0.3 to 0.7 microseconds.

Page 40e, Paragraph 3.6.2.2, Changed to read "transmitter system" in lieu of "transmitter".

Page 40f, Paragraph 3.6.2.2.2, identified power output as being from the -10 unit, deleted maximum poweroutput requirement of 17 watts.

Page 40f, Paragraph 3.6.2.2.3, Changed to read "transmitter system" in lieu of "transmitter".

Page 40f, Paragraph 3.6.2.2.6, Re-defined center frequency.

Page 40f, Paragraph 3.6.2.2.7, Revised to read "resistance" in lieu of "impedance". Deleted sentence "The vendor will be required".

Page 40f, Paragraph 3.6.2.2.8, Changed to read "transmitter system" in lieu of "RF Section" (Two places). Re-defined a "one" to be represented by a minus 2 volt potential instead of by a zero potential. Added tolerance to deviation sensitivity.

Page 40f1, New page added for new paragraph 3.6.2.2.8.1.

Page 40f1, New paragraph 3.6.2.2.8.1 added to specify modulation input sensitivity of -9.

Page 40g, Paragraph 3.6.2.2.9, Changed to read "transmitter system" in lieu of "transmitter."

Page 43, Paragraph 4.3.1.2 Deleted method of conducting the stability check. Revised center frequency test to "during warm-up the transmitter-----".

Page 44, New paragraph 4.3.1.2.1 Added test for 5:1 VSWR requirement.

Page 46a, Paragraph 4.3.6, Changed to read "transmitter system" in lieu of "RF Section".

Page 46a, Paragraph 4.3.6.2, Changed to read "transmitter system in lieu of "RF Section".

Page 46a, Paragraph 4.3.6.2 Deleted method of conducting the stability check. Revised center frequency test to "during warm-up the transmitter ---"

Page 48, Paragraph 4.5.1.4.1, revised temperature and altitude to -45°F and 20,000 ft.

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(F)	Page 48, Paragraph 4.5.1.4.2 Rewrote complete paragraph deleting reference to multiplexing equipment and figure 17. Page 48a, Continuation of 4.5.1.4.2 revision changed five to four minutes, two places Page 49, Paragraph 4.5.1.6 Deleted test C1. Page 50, Paragraph 4.5.1.7 Deleted RF Section from reliability requirements. Page 53, Paragraph 4.5.2.5.2, Describes the multiplexing tests previously included in 4.5.1.4.2. Page 58, Paragraph 4.5.4.2, Deleted requirement for random vibration. Page 58, Paragraph 4.5.4.3, Acceleration, deleted Page 58, Paragraph 4.5.4.4, Temperature-Altitude, deleted Page 58a, Paragraph 4.5.4.5, Humidity, Deleted. Page 58a, Paragraph 4.5.4.6, Revised to limit testing to 1000 mc. Page 58a, Paragraph 4.5.4.7, Revised shock requirements to 100g with rise time of six milli-seconds in lieu of Figure 16. Page 100c, Deleted reference to RF unit. Page 100d, Revised Terminology of -5 Page 100e, New page added for -5 transmitter system diagram. Page Index c, Added -5 Transmitter system (Fig. 19) to Figure Index. Reason for Change: Completion of Basic Design - Vendor Deficiency Revision (F) Change Effective: AB01 and on AC01 and on AD01 and on HA01 and on SB01 and on SC01 and on SD01 and on SE01 and on SF01 and on SG01 and on	VAR	W.G.FREDERICK P.R.R. 1292 R. HAHN				W. Frederick 3/2 n.s. 9-60		
(F)	Page 50, Paragraph 4.5.1.7, Specified that Reliability test system was to be refurbished from Qualification and/or Flight Proof test units. Revision (F) Change Effective: AB01 and on AC01 and on AD01 and on HA01 and on SB01 and on SC01 and on SD01 and on SE01 and on SF01 and on SG01 and on	DEV	W.G.FREDERICK P.D.T.M. 202 R. HAHN				W. Frederick 3/2			

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	[redacted]	APPROVED	REL'D-P	REL DATE
(F)	Page 34, paragraph 3.5.1.1.4, completely revised to clarify maintenance and trouble-shooting test points. Page 37, Granted exceptions to non-operating environmental requirements for certain components of the -4. Para.3.5.1.3 Page 39, paragraph 3.5.2.1.1, added power input frequency tolerance. Page 39, Section 3.5.2.1.2, Completely revised for general clarification, to separately list the inputs to the multiplexer programmer and the multiplexers, deleted requirement for capability of inhibiting a specific number of command pulses, added requirement that command and reset pulses be derived from a crystal controlled bit rate oscillator, added requirement that all three signal input levels be available, added requirement that an external signal source can be used in place of internal source. Page 39a, Section 3.5.2.1.2, the above revisions continued on this page. Page 39a, Section 3.5.2.1.3, moved to this page due to revision of section 3.5.2.1.2 this section completely revised for general clarification, to define type of reset test, added requirement for sem.-automatic mode of operation, added requirement for interchangeable use of internal or external voltage source, added requirement for capability of continuous sampling of source only or sample only, revised description and number of test points and included them under this section. Page 39b, New page added to continue the above revisions to section 3.5.2.1.3. Page 39c, New page added to continue the above revisions to section 3.5.2.1.3. Page 40, Paragraph 3.5.2.1.4, deleted, this information now contained in revised form in paragraph 3.5.2.1.3.2. Page 40, Paragraph 3.5.2.1.5 deleted, this information now contained in revised form in paragraphs 3.5.2.1.2.1.2 and 3.5.2.1.3.2. Page 57, Deleted section 4.5.3, preproduction test for 10-20402-4. Page 58, Continuation of the above revision. Reason for Change: Customer Direction Revision (F) Change Effective: ABO1 and on ACO1 and on ADO1 and on HAO1 and on SAO1 and on SBO1 and on SCO1 and on SDO1 and on SEO1 and on SFO1 and on SGO1 and on	VAR	W.G. FREDERICK	P.R.R. 4293	R. HAHN	R. Hall		W Frederick 3/2			

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	[redacted]	APPROVED	REL/B-P	REL DATE
F	Page 30a, New paragraph 3.3.2.2.8 added to detail common mode requirements. Page 40a, Paragraph 3.6.1.1, Deleted reference to 3.1.1.1.8 as being an exception. Page 40a, Paragraph 3.6.1.1.2, Components deleted. Reason for Change: Engineering Error Revision (F) Change Effective: ABO1 and on ACO1 and on ADO1 and on HAO1 and on SAO1 and on SBO1 and on SCO1 and on SDO1 and on SEO1 and on SFO1 and on SGO1 and on	DEV	W.G. FREDERICK	P.R.R. 1294	R. HAHN	R. Hahn		W Frederick 3/2		
F	Page 39c, added paragraph 3.5.2.1.3.1.4 requiring a printer and detailing it's requirements. Page 46, Added requirement for printer checkout on acceptance tests for -4. Paragraph 4.3.5.2 Reason for Change: Design Improvement Revision (F) Change Effective: ABO1 and on ACO1 and on ADO1 and on HAO1 and on SAO1 and on SBO1 and on SCO1 and on SDO1 and on SEO1 and on SFO1 and on SGO1 and on	DEV	W.G. FREDERICK	C.C.P. 305	R. HAHN	R. Hahn		W Frederick 3/2		

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL WS-133A	NO. D10-20402	PAGE Rev. t

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
(F)	Page 1, paragraph 1.1.3, Revised -100 etc. to -12 etc. Page 2, paragraph 1.4, Revised -100 etc. to -12 etc. Index a, Revised -100 etc. to -12 etc. (two places) Page 2a, Added to include revisions of page 2. Page 3, Paragraph 2.1.1, Reference to MIL-E-4970A deleted Page 4a, Paragraph 2.2.1, Added reference to BAC Documents D2-4861 and D2-5051 Page 16, Section 3.2, Added logic card design requirements to programmer section. Page 16a, Paragraph 3.2.1.1.4.2, Deleted statement about assigning dash numbers to cards at a later date. Page 19a, Paragraph 3.2.2.1.1.1. Revised to specify occurrence of "A" command as being one bit time later during last word of analog frame. Page 21, Paragraph 3.2.2.1.3.2, Revised occurrence time to be during last bit time of last word in lieu of first bit time of first word. Page 22, Paragraph 3.2.2.1.4.3, Deleted requirement for fall time and added max. sample on time. Page 22, Paragraph 3.2.2.1.4.4, Impedance, Deleted Page 22, Paragraph 3.2.2.1.4.5, Revised to require 1.0 milli-amps to coder in lieu of one milli-amp for the first bit time, and a decrease in current by a factor of two for each successive bit time. Page 22, Paragraph 3.2.2.1.6, revised power drain to 1.10 amps in lieu of 1.50 amps. Page 23, Paragraph 3.2.2.2.4, Revised to extend limits of fault isolation from -0.1, +5.1 volts to -2.5, +5.8 volts. Page 24, Section 3.3, Revised logic card numbers to -12 etc., referenced section specifyin card functions. Page 24, Paragraph 3.3.1.1.1, revised sentence to "a minimum" in lieu of "without". Page 24, Paragraph 3.3.1.1.4, Revised assignment of test cards. Page 30, Paragraph 3.3.2.2.2, Deleted maximum expected common mode of 200 milli-volts. Page 30a, New page added for paragraph 3.3.2.2.8. Page 40b, Paragraph 3.6.1.2.2, added new paragraph to include connector requirement. Page 40k, Paragraph 3.7.2.4 added sentence to include current drain requirement of 0.7 amps. **Page 40p, New paragraph 3.8.21 and 3.8.22 added to identify -32 and -33 regulator cards** Page 17, Paragraph 3.2.1.2.3, Added requirement for case ground to be brought out to connector pin.									

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
(F)	Pages 40l, 40m, New pages added for inclusion of logic 40n, 40p, card functions. Page 40h, Paragraph 3.7, Revised -100 etc. logic cards to -12 etc. logic cards. Page 45, Paragraph 4.3.2.3, Revised requirements for checking programmer design. Page 45, Paragraph 4.3.3, Revised -100 cards to -12 etc. Page 45, Paragraph 4.3.3.2, Revised requirements for checking multiplexer design. Page 45a, New page added to continue revision. Page 45a, Paragraph 4.3.4 Revised -100 cards to -12 etc. Page 47, Paragraph 4.3.8 paragraph changed due to addition of acceptance tests for logic cards. Page 47, Paragraph 4.3.8 Revised logic cards to -12 etc. in lieu of -100 etc. Page 47, paragraph 4.4.1, Revised logic cards to -12 etc. in lieu of -100 etc. Page 48, Paragraph 4.5.1.4.1, revised temperature and altitude to -45°F and 20,000 ft. Page 50b, Added new page due to revision of paragraph 4.5.1.7 on page 50a. Page 51, Paragraph 4.5.2, Revised -100 etc. cards to -12 etc., deleted "this set shall not be used for any other tests". Page 51, Paragraph 4.5.2.1.2 definition of data channel of each representative type expanded. Page 53, paragraph 4.5.2.5.1, Revised non-operative altitude and temperature test requirements to 20,000 ft. and -45°F. Page 60, Paragraph 4.6.2, Revised -100 etc. to -12 etc, identified BAC Functional Test Document. Page 0, Paragraph 4.6.3, New paragraph to identify BAC Functional Test Document for -4. Page 93, Figure 7, Revised to require $0.2G^2$/cps from 25 to 2000 cps in lieu of $0.3G^2$/cps. Page 98, Revised command pulse time and analog output, also revised identification code allocation. Page 99, Revised digital pulse to be symmetrical, also revised identification code allocation. Page 101, Revised -100 etc. to -12 etc.								

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REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	[redacted]	APPROVED	REL/B-P	REL DATE
(F)	Reason for Change: Completion of Basic Design Revision (F) Change Effective: ABO1 and on ACO1 and on ADO1 and on HAO1 and on SAO1 and on SBO1 and on SCO1 and on SDO1 and on SEO1 and on SFO1 and on SGO1 and on	VAR	W.G.FREDERICK	P.R.R. 9500	R.HAHN	R. Hahn		4 Aug 32		
(F)	Page 4a, Deleted reference to D2-4571 "Film Report-Still and Motion Picture Photography" Page 78A, Section 6.4.6, Photographic Coverage Requirements deleted. Reason for Change: Customer Direction Revision (F) Change Effective: ABO1 and on ACO1 and on ADO1 and on HAO1 and on SAO1 and on SBO1 and on SCO1 and on SDO1 and on SEO1 and on SFO1 and on SGO1 and on	VAR	W.G.FREDERICK	T.M. 49-1	R.HAHN	R. Hahn		4 August 32		

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL WS-133A	NO. D10-20402	PAGE Rev. W

REVISION

See Rev. page ah

Page Numbering Completely Revised

G | Title Page II - Revised list of Active pages.

Title Page III - Revised list of Active pages.

Revision Pages -
Added to include Rev. G.

Index a page - Revised sub-heading 3.1 through 3.7 and 4.5.1 through 4.5.4 by removing Part Numbers and adding part Nomenclature.
Page numbers were revised.
Sect. 3.8 & 3.9 added

Index b page - Page numbers were revised.

Index c page - Figures 9, and 10 are deleted.
Page numbers were revised.

Index d page - Figures 20 through 23 are new.
Page numbers were revised.

H

Page 1 through 22 were pages 1 through 15.

Page 1- Paragraph 1.1.2, "(10-20402-1, 10-20402-41)" was "(10-20402-1)".
Paragraph 1.1.3, "Multiplexer (10-20402-2, 10-20402-42)" was "Multiplexer Case (10-20402-2) and logic cards (10-20402-12, -13, -14, -15, etc.)."

Page 2- Paragraph 1.2 "(10-20402-4, 10-20402-44)" was "(10-20402-4)".
Paragraph 1.4, "(10-20402-6, 10-20402-46)" was "(10-20402-6)" and all places within paragraph.
References to specific part numbers were deleted.
Paragraph 1.4.1, "(10-20402-7, 10-20402-47)" was "(10-20402-7)."
Part numbers were replaced by part nomenclature.

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE. GIVE ALL PERTINENT INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DATA, ETC.	
G	Page 3- Paragraph 1.4.2, "(10-20402-8, 10-20402-48)" was "(10-20402-8)", line 3, "Control Box was 10-20402-7 (Multiplexer Control)." Paragraph 1.5 and 1.6 are new. Page 7- D2-7687 and D2-9129, Boeing Documents - new. "D2-4751 (Film report Doc.)" was "deleted" by Rev. (F) 21-50000, 21-50065 and 21-50105 Boeing Drawings - new. Pages 23 through 37 were pages 16 through 23a. Page 23- Paragraph 3.2, "Design Requirements - Multiplexer Programmer and Logic Cards" was "Design Requirements for 10-20402-1 (Multiplexer Programmer case) and -12 etc. (Logic Cards)". Lines 2 and 3 " . . . 10-20402-1, 10-20402-41 . . . " added to first sentence. Page 27- Paragraph 3.2.1.2.5, last sentence, D2-9129 was D5-2288. Paragraph 3.2.1.2.6, line 14, sentence "The multiplexer system grounding etc." was added. Page 32- Paragraph 3.2.2.1.1,, line 16, "128 channel portion of the area "C" multiplexer unit" was "larger multiplexer unit (10-20402-2)". "(a)" and "(b)", completely revised. Page 34- Paragraph 3.2.2.1.4.3, completely revised. Paragraph was rewritten and requirements redefined. Paragraph 3.2.2.1.4.4, "Impedance - the output etc." was deleted by rev. F. Requirements were reinstated. Paragraph 3.2.2.1.4.5, line 2, "to the coder for a full etc." was "to the coder."; line 6, "Milliamperes." was "Mill-amps.".	

See Rev. Page ah

REV LTR	REVISION	DEV YAR REQUIRED / ECP NO. / DRAWN / CHECKED / APPROVED / RELEASED / REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DOA'S ETC.	See Rev. Page ah
G	Page 35- Paragraph 3.2.2.1.6 was rewritten. Power drain limitations and references were revised. Paragraph 3.2.2.1.6.1 was previously referenced information of paragraph 3.1.2.1.3. Completely revised. Paragraph 3.2.2.1.6.2 was previously referenced information of paragraph 3.1.2.1.3. Completely revised.	
	Page 36- Paragraph 3.2.2.1.9, New specification Paragraph 3.2.2.2.2, Completely revised.	
	Page 37- Paragraph 3.2.2.2.2.1, New sub-paragraph. Paragraph 3.2.2.2.2.2, New sub-paragraph. Paragraph 3.2.2.2.4, Completely revised.	
	Pages 38 through 43 were pages 24 through 30a.	
	Page 38- Paragraph 3.3, "Design Requirements for Multiplexer and Logic Cards" was "Design Requirements for 10-20402-2 (Multiplexer Case) and -12, etc. (Logic Cards)". Paragraph 3.3, First sentence, " . . .Multiplexer (10-20402-2 or 10-20402-42) for . . ." was ". . .Multiplexer Unit for . . ."	
	Page 39- Paragraph 3.3.2.1.3, line 3, "the command logic to be used etc." was "the representative command logic to be used etc.".	
	Page 42- Paragraph 3.3.2.2, line 2, "and applicable input data etc." was "and input data signals in accordance etc.". Paragraph 3.3.2.2.2, completely revised. Paragraph 3.3.2.2.3, "Delete" was "the DC drift over the operating etc.". Paragraph 3.3.2.2.4, "Delete" was "paragraph 3.2.2.2.2 is applicable". Paragraph 3.3.2.2.5, "Delete" was "The linearity of low level signal etc.". Paragraph 3.3.2.2.6, Completely revised - requirements reduced.	

REV LTR	REVISION
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE AND EFFECTIVITY INFORMATION, PRODUCTION AND TOOLING INFORMATION, PATENT STATUS, ETC.

See Rev. Page ah

O	Page 43- Paragraph 3.3. .2.8, line 2, "20,000 to 1" was "100,000 to 1".
	Pages 45 through 56 were pages 34 through 40.
	Page 45- Paragraph 3.5, "Design Requirements - Simulation and Test Equipment" was "Design Requirements for 10-20402-4". The general explanation was completely rewritten to include both 10-20402-4 and 10-20402-44 equipment. Paragraph 3.5.1.1.1, completely revised to expand specifications for special tools.
	Page 4[illegible]- Paragraph 3.5.1.1.5, completely revised to expand requirements for weight variance. Paragraph 3.5.1.1.6, line 2, "D2-7687" was "D5-[illegible]300".
	Page 47- Paragraph 3.5.1.1.8.1, new specification. Paragraph 3.5.1.2.1, requirement for R.F. filters added. Paragraph 3.5.1.2.2, line 6, "ATP Paper Block Assemblies etc.", exception added. Paragraph 3.5.1.2.5, New paragraph. Requirement for metal enclosures added.
	Page 48- Paragraph 3.5.1.4, lines 1 and 2, "with the exception etc.", added reference change only.
	Page 49- Paragraph 3.5.1.5.1.2, lines 11,12 and 13, Added to paragraph. Paragraph 3.5.1.5.1.3, lines 6 and 7, "Commercially supplied units are etc.", added.
	Page 5[illegible]- Paragraph 3.5.2.1, completely revised. Paragraph 3.5.2.1.2, "Multiplexer equipment" was "Multiplexer and Multiplexer programmer", requirement. Paragraph 3.5.2.1.2.1.1, lines 6,9,10 are new, exception added to requirement.

REV LTR	REVISION	DEV. CLASS	ATP	DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RETRO DATA ETC.			

See Rev. Page ah

G

Page 51- Paragraph 3.5.2.1.2.2.1, "10-20402-6" removed from sentence.
Paragraph 3.5.2.1.2.2.2, completely revised.
Paragraph 3.5.2.1.2.2.4, second sentence was deleted.
Paragraph 3.5.2.1.2.2.4.1, added to describe common mode signal input requirement of 10-20402-4 equipment.
Paragraph 3.5.2.1.2.2.4.2, added to describe common mode signal input requirement of 10-20402-44 equipment.
Paragraph 3.5.2.1.3.1, lines 6 and 7, "and Multiplexer equipment feedback current." added to sentence.

Page 52- Paragraph 3.5.2.1.3.1, Item (.), added.
Paragraph 3.5.2.1.3.1.1, completely revised. Separate requirements for 10-20402-4 and 10-20402-44 equipment added. Sub-paragraph "(a)" completely revised.

Page 53- Paragraph 3.5.2.1.3.1.3, Completely revised. Reference to a relay was deleted.

Pages 53 & 54-
Paragraph 3.5.2.1.3.1.4, Completely revised. To specify applicable printers for respective equipment 10-20402-4 and 10-20402-44.

Page 54- Paragraph 3.5.2.1.3.1.4.2, line 2 of sub-paragraph "(a)" ". . . of the basic unit" was ".. . of the basic 10-20402-4".

Page 55- Paragraph 3.5.2.1.3.2, lines 13,14 and 15 added.

Pages 57 through 63 were pages 40a through 40g.

Page 57- Paragraph 3.6, "Design Requirements - Sled Transmitter System" was "Design Requirements for 10-20402-5".

REV LTR	REVISION	DEV VAR REQUESTED	MCC NO. DRAWN CHECKED APPROVED REL BY REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DATE, ETC.		
			See Rev. Page ah
G	Page 61- Paragraph 3.6.2.1.8, Descriptive Criteria was deleted.		
	Pages 64 through 67 were pages 40h through 40k.		
	Page 64- Paragraph 3.7, "Design Requirements, Multiplexer System" was "Design Requirements for 10-20402-6 Multiplexer system consisting of 10-20402-7 and etc.". Paragraph 3.7, Descriptive Criteria, Completely revised. Paragraph 3.7.1.1, line 2, "3.2.1.1" was "3.3.1.1". Paragraph 3.7.1.2, line 2, "3.2.1.2" was "3.1.1.2 and exceptions".		
	Page 67- Paragraph 3.7.2.1, line 5, "Auxiliary Box" was "-8 (auxiliary box)"; line 6, "Auxiliary Box" was "system"; line 8, "with each -8 (Auxiliary Box) etc." was deleted from sentence. Paragraph 3.7.2.2, line 2, "Auxiliary Box" was "-8"; line 3, "Control Box" was "-7"; line 4, "Multiplexer Programmer" was "-1 Multiplexer Programmer". Paragraph 3.7.2.4, line 1, "Multiplexer" was "-6"; line 4, "-7" deleted from sentence. Paragraph 3.7.2.4, line 7, "-7" deleted from sentence.		
	Pages 68 through 83 were pages 40 l through 40p.		
	Section 3.8, Completely revised to reflect new part numbers and amplify description. 10-20402-12 and 10-20402-13 were deleted. 10-20402-30 description transfered to new section 3.9 . 10-20402-36 through 10-20402-38, 10-20402-49 through 10-20402-67, and 10-20402-49 through 10-20402-77 added to section 3.8 with applicable descriptions and usage.		

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REV LTR	REVISION
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE INCLUDE ETC. INFORMATION, PRODUCTION AND TOOLING INFORMATION EFFECTIVITY ETC.
	See Rev. Page ah
Q	Pages 84 and 85- Section 3.9 New section for accessory equipment. 10-20402-30 transfered from section 3.8. 10-20402-39, 10-20402-43, 10-20402-45, and 10-20402-66 added. Pages 86 through 114 were pages 41 through 61. Page 86- Paragraph 4.1.1.2, line 9, "Changes to the approved procedure etc." was "Changes to the procedure etc."; line 10,"only after BAC concurrance." was "only after BAC approval". Page 88- Paragraph 4.3, Descriptive specifications contained within paragraph were referenced to paragraph 4.1.1. Rewritten Paragraph 4.3.1, "Individual tests for 10-20402-0, 10-20402-40" was "Individual tests for 10-20402-0". Page 89- Paragraph 4.3.1.3, "a minimum operational test consisting etc." was "equipment operation within the performance etc.". Paragraph 4.3.2, "Individual tests for 10-20402-1, 10-20402-41" was "Individual tests for 10-20402-1". Page 90- Paragraph 4.3.2.1, line 3 "With logic cards inserted . . . etc." was "with -12 etc. cards inserted . . . etc.". Lines 7 through 11 - new specification. Paragraph 4.3.2.3, lines 1 and 2, ". . . Sim. and Test Equipment . . . etc." was ". . . test equipment (-4) . . . etc.". Page 91- Paragraph 4.3.3, "Individual tests for 10-20402-2, 10-20402-42" was "Individual tests for 10-20402-2".

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVITY INFORMATION, PRODUCTION AND TOOLING INCORPORATION, RERUN DATA, ETC.
G	Page 92- Paragraph 4.3.3.2, lines 8 through 12, new specification. Paragraph 4.3.4, "Individual tests for 10-20402 -6, 10-20402-46" was "Individual tests for 10-20402-6". Paragraph 4.3.4, line 2, "performed with logic cards inserted." was performed with -12 etc. cards inserted". Paragraph 4.3.4.1, line 4, "10-20402-6 or 10-20402-46 Multiplexer System, Figure 15 etc." was "-6 the envelope of Figure 15 etc." Paragraph 4.3.4.2, lines 2 and 3, new. Paragraph 4.3.5, "Individual tests for (10-20402-4 or 10-20402-44)" was "Individual tests for 10-20402-4". Page 93- Paragraph 4.3.5.2, "Performance of 10-20402-4" was "performance of -4"; descriptive criteria completely revised; Items 12 through 15 - new specification. Page 94- Paragraph 4.3.5.2, Items 16 and 17, new specifications. Page 96- Paragraph 4.3.7, Completely revised. Page 97- Paragraph 4.3.8, "Sampling tests for 10-20402 -0, -1, -2, etc." was "Sampling tests for 10-20402, -1, -2, -4, -5, -6, -12 etc." Paragraph 4.4.1, "Component testing for 10-20402-0, -1, -2, etc." was "Component testing for 10-20402, -1, -2, -4, -5, -6, -12 etc." Paragraph 4.5.1, "Preproduction (flight Proof) tests for 10-20402-40" was "Preproduction (flight proof) tests for 10-20402". Paragraph 4.5.1.2, line 6, "1/2 octave/minute" was "one octave/minute"; "both upwards and downwards etc." removed from sentence. Page 98- Paragraph 4.5.1.4.2, "Flight conditions for 10-20402-40" was "Flight conditions for 10-20402".

See Rev. Page ah

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DLATE ETC.		REV. APP. / REQUESTED / ACC. NO. / DRAWN / CHECKED / STRESS / APPROVED / REL. DATE
			See Rev. Page ah
G	Page 99-	Paragraph 4.5.1.4.2 (d), lines 2,4,9, and 11, "600°F" was "700°F".	
	Page 100-	Paragraph 4.5.1.6, test c2, new specification.	
	Page 101-	Paragraph 4.5.1.7, Reliability tests are deleted.	
	Page 103-	Paragraph 4.5.2, "Preproduction (flight proof) tests for Multiplexer Programmer, Multiplexer, and Multiplexer System" was "Preproduction (flight proof) tests for 10-20402, -1, -2, -6 and -12 etc.". Criteria completely revised. Paragraph 4.5.2.1.2, Completely revised.	
	Page 104-	Paragraph 4.5.2.1.2, Rewritten, intent unchanged.	
	Page 105-	Paragraph 4.5.2.3.1, line 1, "Multiplexer Programmer (10-20402-41) and Multiplexer (10-20402-42)" was "10-20402-1 and -2"; line 3, deleted "10-20402-1, (10-20402-2)". Paragraph 4.5.2.3.2, line 1, "Multiplexer System (10-20402-46)" was "10-20402-6"; line 8, "1/2 octave/minute" was "one octave/minute"; line 9, "both upward and downwards etc." deleted from sentence.	
	Page 106-	Paragraphs 4.5.2.4.1 and 4.5.2.5.2, Heading revised to reflect new part numbers. Paragraph 4.5.2.5.2, Item (C), lines 2 and 3, "600°F" was "700°F".	
	Page 107-	Paragraph 4.5.2.5.2, lines 4 and 5, "600°F" was "700°F". Paragraph 4.5.2.5.2, line 9, "(10-20402-46)" was "10-20402-6".	
	Page 109-	Paragraph 4.5.2.7, test a3, "and Control Boxes" - new; test d1, "and Control Boxes" - new; test d2, "and Control Boxes" - new.	

REV LTR	REVISION
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE TYPE AND INFORMATION, PRODUCTION AND TOOLING INFORMATION, REWORK EFFECTS, ETC.

See Rev. Page ah

G

Page 110- Paragraph 4.5.4.2, last sentence deleted.

Page 113- Paragraph 4.6.2, "Multiplexer equipment" was "10-20402, -1, -2, -6, -5, -12 etc."

Pages 115 through 117 were pages 61 through 64.

Pages 118 through 139 were pages 65 through 83.

Page 118- Paragraph 6.1.1.2, "Area "C" Multiplexer" was "10-20402-1 and 10-20402-2"; "Area "A" and "B" was "10-20402-3"; "(See Figure 21 etc.)" - new. Paragraph 6.1.1.4, Completely revised.

Page 119- Paragraph 6.1.1.4, Completely revised.

Pages 140 through 166 were pages 84 through 100e.

Page 147- Vibration envelope from 1000 cps to 2000 cps changed. 2000 cps point, 0.0063 G^2/cps was 0.025 G^2/cps.

Page 151- Figure 9 - Deleted.

Page 152- Figure 10 - Deleted.

Page 153- Figure 11 - Completely revised to reflect new part numbers.

Page 154- Figure 12 - Waveforms revised.

Page 156- Figure 14, Completely revised to reflect new part numbers.

Page 159- Figure 17, Completely revised to reflect new part numbers and test arrangement.

Page 161- Figure 19, "Attenuator" removed from Multiplier.

Pages 162 and 163-
New Figures 20 and 21 respectively.

Pages 164 and 165-
New Figures 22 and 23 respectively.

Page 166- Table 1, deleted.

Page 113- Paragraph 4.6.3, "10-20402-4, 10-20402-44" was "10-20402-4"

REV LTR	REVISION	DEV VAR	REQUESTED	MCR NO	DRAWN	CHECKED	STRESS	APPROVED	REL'D-F	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
G	**Reason for Change:** Completion of basic design. Vendor deficiency. Revision G Change Effective: SA01 - SG01 (003b) AB01 - AB08 (004b) EWA 301, EWA 3205 AC04 AD01 & On AE01 & On	VAR	W.G. FREDERICK	PRR 1677	C.S. MURRAY					

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED MCR NO. DRAWN CHECKED STRESS APPROVED REL/B-P REL DATE
	PRR 1494	See Rev. Page aj
C	Pages 1 through 22 were pages 1 through 15. Page 1- Paragraph 1.1.1, "(10-20402-0, 10-20402-40)" was "(10-20402-0)". Page 2- Paragraph 1.3.2 "Multiplier and Amplifier Unit" was "Attenuator, Multiplier and Amplifier Unit". Page 8- Paragraph 3.1, "Design Reqmts. RF section" was "Design Reqmts. for 10-20402"; line 3, "(10-20402-0 and 10-20402-40)" added to sentence. Page 12- Paragraph 3.1.2.5, "D2-9129" was "D5-2288". Page 13- Paragraph 3.1.1.2.6, line 3, "3.2.9.1" was "3.2.2.1". Page 14- Paragraph 3.1.1.3.2.1, line 5, "600°F" was "700°F"; line 6, "600°F" was "700°F"; line 7 "3minutes" was "4 minutes". Page 15- Paragraph 3.1.1.4.1, Completely revised. Page 17, 18-Paragraph 3.1.2.1.3, completely revised. Page 19- Paragraph 3.1.2.1.8, Deleted. Paragraph 3.1.2.1.11, Completely revised. Page 20- Paragraph 3.1.2.2.3, line 5, "18 watts" was "17 watts".	

REV LTR	REVISION
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVITY INFORMATION, PRODUCTION AND TOOLING INFORMATION, REBUY DOA'S, ETC.
0	**Reason for Change:** Correction of design deficiencies, design improvement and correction to specification requirements.

Revision (G) Change Effective:

SA01 - SG01 (003)
SA01 - SG01 (003b)
AB01 - AB08 (004)
AB01 - AB08 (004b)
EWA 3019
EWA 3181
AD01 & On
AE01 & On
AC 1 - AC04

DEV VAR
VAR
W.G FREDERICK
PRR 1494
C.S. MURRAY
CHECKED
PROCESS
APPROVED
REL BY
REL DATE

REV LTR	REVISION	DEV. V&A REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.								

See Rev. Page ap

PRR 9500

0 Pages 23 through 37 were pages 16 through 23a.

Page 23- Paragraph 3.2.1.1, lines 1,2, and 3 were deleted. Referenced applicable paragraphs of section 3.1.1.1 were retyped and included as subsections of 3.2.1.1.
Paragraph 3.2.1.1.1 was referenced paragraph 3.1.1.1.1.
Paragraph 3.2.1.1.1.1, was referenced paragraph 3.1.1.1.1.1.
Paragraph 3.2.1.1.1.2, was referenced paragraph 3.1.1.1.1.2.
Paragraph 3.2.1.1.2, was referenced paragraph 3.1.1.1.2.

Page 24- Paragraph 3.2.1.1.2.1, was referenced paragraph 3.1.1.1.2.2.
Paragraph 3.2.1.1.2.2, was referenced paragraph 3.1.1.1.2.3.
Paragraph 3.2.1.1.2.3, was referenced paragraph 3.1.1.1.2.3.1.
Paragraph 3.2.1.1.3, was referenced paragraph 3.1.1.1.3.
Paragraph 3.2.1.1.4, was paragraph 3.2.1.1.1.
Paragraph 3.2.1.1.5, was referenced, paragraph 3.1.1.1.5.
Paragraph 3.2.1.1.6, was referenced paragraph 3.1.1.1.6.

Page 25- Paragraph 3.2.1.1.7, was paragraph "3.2.1.1.2.".
Paragraph 3.2.1.1.8, was paragraph "3.2.1.1.3".
Paragraph 3.2.1.1.9, was paragraph "3.2.1.1.4".
Paragraph 3.2.1.1.9.1, was paragraph "3.2.1.-1.4.1".
Paragraph 3.2.1.1.9.2, was paragraph "3.2.1.-1.4.2".

REV LTR	REVISION	DEV. VAR REQUESTED MCR NO.	DRAW.	CHECKED	STRESS	APPROVED	REL. DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.						
		See Rev. Page ap					
G	Page 26- Paragraph 3.2.1.1.9.3 was paragraph 3.2.1.1.4.3. Paragraph 3.2.1.1.9.4 was paragraph 3.2.1.1.4.4. Paragraph 3.2.1.1.10 was paragraph 3.2.1.1.5. Paragraph 3.2.1.1.11 was referenced paragraph 3.1.1.1.11 Paragraph 3.2.1.2. Reference to Paragraph 3.1.1.2 and sub-paragraphs thereof deleted. Requirements defined in detail in sub-paragraphs of 3.2.1.2. Paragraph 3.2.1.2.1, was referenced paragraph "3.1.1.2.1". Paragraph 3.2.1.2.2, was referenced paragraph "3.1.1.2.2". Paragraph 3.2.1.2.3, was paragraph "3.2.1.2.1". Paragraph 3.2.1.2.4, was referenced paragraph "3.1.1.2.4".						
	Page 27- Paragraph 3.2.1.2.5, was referenced paragraph 3.1.1.2.5. Paragraph 3.2.1.2.6, was paragraph "3.2.1.2.3". Paragraph 3.2.1.2.6, line 11, "3.2.9.1" was "3.2.2.1". Paragraph 3.2.1.2.7, was paragraph "3.2.1.2.2". Paragraph 3.2.1.3, lines 1 through 5, were deleted. Previously referenced paragraphs of section 3.1.1.3.1 and 3.1.1.3.2 were re-typed and included as subsections of 3.2.1.3. Paragraph 3.2.1.3.1, was referenced paragraph "3.1.1.3.1". Paragraph 3.2.1.3.1.1, was referenced paragraph "3.1.1.3.1".						

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED / MCR NO. / DRAWN / CHECKED / STRES / APPROVED / REL/B-P / REL DATE
		See Rev. Page ap
0	Page 28- Paragraph 3.2.1.3.1.2, was referenced paragraph "3.1.1.3.1.2". Paragraph 3.2.1.3.1.3, was referenced paragraph "3.1.1.3.1.3". Paragraph 3.2.1.3.1.4, was referenced paragraph "3.1.1.3.1.4". Paragraph 3.2.1.3.1.5, was referenced paragraph "3.1.1.3.1.5". Paragraph 3.2.1.3.1.5.1, was referenced paragraph "3.1.1.3.1.5.1". Paragraph 3.2.1.3.1.6, was referenced paragraph "3.1.1.3.1.6". Paragraph 3.2.1.3.1.7, was referenced paragraph "3.1.1.3.1.7". Paragraph 3.2.1.3.2, was referenced paragraph "3.1.1.3.2". Paragraph 3.2.1.3.2.1, was referenced paragraph "3.1.1.3.2.1". Paragraph 3.2.1.3.2.2, was referenced paragraph "3.1.1.3.2.2". Paragraph 3.2.1.3.2.3, was referenced paragraph "3.1.1.3.2.3". Page 29- Paragraph 3.2.1.3.2.4, was referenced paragraph "3.1.1.3.2.4". Paragraph 3.2.1.3.2.5, was referenced paragraph "3.1.1.3.2.5". Paragraph 3.2.1.3.2.6, was referenced paragraph "3.1.1.3.2.6". Paragraph 3.2.1.3.2.7, was referenced paragraph "3.1.1.3.2.7". Paragraph 3.2.1.4, previously referenced paragraphs of section 3.1.1.4 were retyped and included as sub-paragraphs of paragraph 3.2.1.4. Paragraph 3.2.1.4.1, was referenced paragraph "3.1.1.4.1".	

REV LTR	REVISION	DEV/VAR REQUESTED	MCR NO.	PAN	CHECKED	STRESS	APPROVED	REL-B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DEA's ETC.								
									See Rev. Page ap
G	Page 30- Paragraph 3.2.1.5, reference ' to paragraph 3.1.1.5 deleted. Detail requirements for product identification defined in detail in 3.2.1.5 sub-paragraphs. Paragraph 3.2.1.5.1, was referenced paragraph "3.1.1.5.1". Paragraph 3.2.1.5.2, was referenced paragraph "3.1.1.5.2". Paragraph 3.2.1.5.3, was referenced paragraph "3.1.1.5.3".								
	Page 31- Paragraph 3.2.1.5.4, new paragraph added. Paragraph 3.2.1.5.4.1, new paragraph added. Paragraph 3.2.1.5.4.2, new paragraph added.								
	Page 34- Paragraph 3.2.2.1.5, reference to paragraphs 3.1.2.1.1 and 3.1.2.1.4 were deleted. Requirements restated in detail in paragraphs 3.2.2.1.5, and 3.2.2.1.9 respectively.								
	Page 36- Previously referenced paragraph of subsection 3.1.2.1.12 was retyped and included in paragraph 3.2.2.1.8. Previously referenced paragraph of subsection 3.1.2.2.1 was retyped and included in paragraph 3.2.2.2.1.								
	Pages 38 through 44 were pages 24 through 32								
	Page 38- Paragraph 3.3.1.1, line 2, "3.2.1.1" was "3.1.1.1"; with the exception of etc. is deleted. Paragraphs 3.3.1.1.1, 3.3.1.1.2, 3,3.1.1.3, 3.3.1.1.4, and 3.3.1.1.5 are specified in reference of paragraph 3.3.1.1. Paragraph 3.3.1.2, line 1, "3.2.1.2" was "3.1.1.2"; "with the exception etc." is deleted. Paragraph 3.3.1.2.1, reference paragraph "3.3.1.2" was "3.2.1.2.1". Paragraph 3.3.1.2.2, reference paragraph "3.3.1.2" was "3.2.1.2.2". Paragraph 3.3.1.2.3. reference paragraph "3.3.1.2." was "3.2.1.2.3". Paragraph 3.3.1.3, line 3, "3.2.1.3.2" was "3.1.1.3.2"; line 5 "3.2.1.3.1" was "3.1.1.3.1".								

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S ETC.	DEV. VAF REQUESTED / MCE NO. / DRAWN / CHECKED / STRESS / APPROVED / REL'D-P / RFL DATE
		See Rev. Page ap
G	Page 39- Paragraph 3.3.1.4, line 1, "3.2.1.4" was "3.1.1.4". Paragraph 3.3.1.5, line 1, "3.2.1.5" was "3.1.1.5".	
	Page 41- Paragraph 3.3.2.1.7, "3.2.2.1.5" was "3.1.2.1.1". Paragraph 3.3.2.1.8, "3.2.2.1.9" was "3.1.2.1.4".	
	Page 42- Paragraph 3.3.2.2.1, "3.2.2.2.1" was "3.1.2.2.1". Paragraph 3.3.2.2.6, Descriptive criteria now contained within paragraph was described under paragraphs 3.3.2.2.6.1 and 3.3.2.2.6.2.	
	Pages 45 through 56 were pages 34 through 40	
	Page 45- Paragraph 3.5.1.1, line 2, "3.2.1.1" was "3.1.1.1"; line 3 and 4, "3.2.1.1.4, 3.2.1.1.5, 3.2.1.1.7, 3.2.1.1.8, 3.2.1.1.9, were "3.1.1.1.4, 3.1.1.1.5, 3.1.1.1.7, 3.1.1.1.8, 3.1.1.1.9, 3.1.1.1.10, 3.1.1.1.11 and 3.1.1.1.2.3 respectively.	
	Page 46- Paragraph 3.5.1.1.6, "3.2.1.1.5" was "3.1.1.1.5"; Paragraph 3.5.1.1.7, was paragraph "3.5.1.1.6". Paragraph 3.5.1.1.7.1, was paragraph "3.5.1.1.6.1".	
	Page 47- Paragraph 3.5.1.1.8, was paragraph 3.5.1.1.7. Paragraph 3.5.1.2, completely revised to incorporate new references.	
	Page 48- Paragraph 3.5.1.3, referenced paragraph changed for compatability with other revised paragraphs as follows: 3.2.1.3.1 was 3.1.1.3.1, 3.2.1.3.2 was 3.1.1.3.1.2, and 3.2.1.3.1.4 was 3.1.1.3.1.4. Paragraph 3.5.1.4, line 1, "3.2.1.5" was "3.1.1.5".	

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/E-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN TAB'S, ETC.	VAR	W.G. FREDERICK	PRR 9500	C.S. MURRAY					

Pages 57 through 67 were pages 40a through 40k.

O Page 64- Paragraph 3.7.1.1, line 2, "3.2.1.1" was "3.3.1.1.".
Paragraph 3.7.1.2, line 2 "3.2.1.2" was "3.1.1.2"; "with the exception etc." is deleted.

Page 65- Paragraphs 3.7.1.2.1 and 3.7.1.2.2 are specified per reference of 3.7.1.2.
Paragraphs 3.7.1.2.3 and 3.7.1.2.4, are specified per reference of 3.7.1.2.

Page 67- Paragraph 3.7.2.4, line 8, "3.2.2.1.8" was "3.1.2.1.12"; line 9, "3.2.2.1.6" was "3.1.2.1.3".

Pages 68 through 96 were pages 40e through 46b

Page 90- Paragraph 4.3.2.2, "Product Examination"- new heading.

Reason for change: Clarification and consolidation of Specification requirements.

BOEING AIRPLANE COMPANY	MODEL	NO.	PAGE
	MS-133A	D10-20402	rev. ap

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED MCR NO. DRAWN CHECKED STRESS APPROVED REL/B-P REL DATE
H	Title Page II - Revised list of active pages Title Page III - Revised list of active pages. Rev. x page - "Figures 20 through 23 are new" was "Figures 20 through 25 are new". Revision Pages - Added revision pages aq thru az. Index b Page - Added paragraph 4.6.4. Page 3 - Paragraph 1.5 In third sentence "10-20402-86" was "10-20402-77". Page 6 - Paragraph 2.1.3 " 'Specifications and Standards', Use of, dated 19 August 1954" was " 'Specifications and Standards', Use of, dated 19 August 1954". Paragraph 2.2.1 "GM07-59-2617A" was "D2-2444" "STL Document 'Electro Interference Control Requirement for Minuteman'" was "Boeing Document 'Electro Interference Control Requirements, Equipment'". Page 7 - Paragraph 2.2.1 "D2-5051 Boeing Document, 'Functional Test . . . Equipment 10-20402-44'" was "D2-5051 Boeing Document, 'Functional Test . . . Equipment 10-20402-4'". Paragraph 2.2.1 Added D2-10365 and D2-4858. Page 12 - Paragraph 3.1.1.2.1 ". . . the requirements of STL Document GM07-59-2617A. The equipment is defined as Class I per GM07-59-2617A." was ". . . the requirements of BAC Document D2-2444. The equipment is defined as Class I per D2-2444." Paragraph 3.1.1.2.3 ". . . on BAC Drawing 10-20402" was ". . . an BAC Drawing 10-20402". Page 13 - Paragraph 3.1.1.2.6 "The provisions of GM07-59-2617A, paragraph 3.2.9.1 apply. " was "The provisions of D2-2444, paragraph 3.2.9.1 apply." Paragraph 3.1.1.2.7 "The provisions of GM07-59-2617A, paragraphs 3.2.3 and 3.2.4 apply." was "The provisions of D2-2444, paragraph 3.2.3 apply." Page 26 - Paragraph 3.2.1.1.9.3 Entire paragraph deleted.	See Rev. page aw

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
H	Page 26 - Paragraph 3.2.1.2.1 "The equipment shall meet the requirements of STL Document GM07-59-2617A. The equipment is defined as Class I per GM07-59-2617A." was "The equipment shall meet the requirements of BAC Document D2-2444. The equipment is defined as Class I per D2-2444." Page 27 - Paragraph 3.2.1.2.6 "The provisions of GM07-59-2617A, paragraph 3.2.9.1 apply". was "The provisions of D2-2444, paragraph 3.2.9.1 apply." Paragraph 3.2.1.2.7 "The provisions of GM07-59-2617A, paragraphs 3.2.3 and 3.2.4 apply." was "The provisions of D2-2444 paragraph 3.2.3 apply." Page 28 - Paragraph 3.2.1.3.1.5.1 "D2-4123" was "D2-4132". Page 30 - Paragraph 3.2.1.5 In second sentence deleted "stock number". Page 36 - Paragraph 3.2.2.1.8 rewritten to define more accurately equipment capability with respect to transients in the power system. Page 37 - Paragraph 3.2.2.2.2.2 ". . . in paragraph 3.3.2.2.6 for a grounded center-tapped 1K source." was ". . . in paragraph 3.3.2.2.6 for an ungrounded (floating) data source." Page 40 - Paragraph 3.3.2.1.6.1 Paragraph expanded to include a method of satisfying the requirement for sampling rates in excess of 800 sps by the cross-strapping of analog input lines. Page 45 - Paragraph 3.5.1.1 ". . . 3.2.1.1.10 and 3.2.1.1.11." was ". . . 3.2.1.1.10, 3.2.1.1.11, and 3.2.1.1.2.1.2." Page 47 - Paragraph 3.5.1.2 "to 3.2.1.2.5" deleted. Paragraph 3.5.1.2.1 ". . . requirements of STL Document GM07-59-2617A. The equipment is defined as Class III per GM07-59-2617A." was ". . . requirements of BAC Document D2-2444. The equipment is defined as Class III per D2-2444." Page 49 - Paragraph 3.5.1.5.1.3 Deleted.	See Rev. page aw							

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED MCR NO. DRAWN CHECKED STRESS APPROVED REL/B-P REL DATE
H	Page 51 - Paragraph 3.5.2.1.2.2.2 "This power supply shall be floating with respect to the 28 VDC power supply." deleted. Page 53 - Paragraph 3.5.2.1.3.1.1 (a) Added "The automatic mode applies to paragraph 3.5.2.1.3.1 (a) and (e) only". Paragraph 3.5.2.1.3.1.1 (b) Added "The semi-automatic mode applies to paragraph 3.5.2.1.3.1 (a) thru (g)." Paragraph 3.5.2.1.3.1.1 (c) Added "The manual mode applies to paragraph 3.5.2.1.3.1 (a) thru (g)." Paragraph 3.5.2.1.3.1.4 Added the following at the end of paragraph "This requirement does not apply to paragraph 3.5.2.1.3.1.3." Page 55 - Paragraph 3.5.2.1.3.1.4.3 New paragraph modifying color requirements of paragraph 3.5.1.1.7 for Hewlett-Packard printer supplied with 10-20402-44. Paragraph 3.5.2.1.3.2 ". . . inadvertant shorts to ground during testing . . ." was ". . . inadvertant shorts during testing. . ." Page 64 - Paragraph 3.7 In last sentence of first sub-paragraph "10-20402-86" was "10-20402-77". Page 67 - Paragrapn 3.7.2.2 Expanded to include a method of satisfying the requirements for sampling rates in excess of 800 sps by the cross-strapping of analog input lines. Paragraph 3.7.2.4 Second sentence - "1.05 amps" was "0.95 amps". Page 68 - Paragraph 3.8 In second sentence "10-20402-86" was "10-20402-77". Paragraph 3.8.3 Added new sub-heading as follows "(d) Channel "B" inhibit pulses to the Analog Sequencer Gate". Page 69 - Paragraph 3.8.4 (a), (b) and (c) partially revised to describe more accurately the signals generated.	See Rev. page aw

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
H	Page 71 - Paragraph 3.8.8 (b) "A 'start' and 'stop' signal for the Voltage and Current Clamps of this Multiplexer." was "A 'start' signal for the Voltage and Current Clamps of this Multiplexer." Paragraph 3.8.8 Added statement giving additional descriptive information for the Countdown (2B) Card. Page 72 - Paragraph 3.8.9 Third sentence - "count" was "current". Page 83a- Added page 83a. Page 83b- Added page 83b. Page 83c- Added page 83c. Page 85 - Paragraph 3.9.2.2 "10-20402-68" was "10-20402-44". Page 86 - Paragraph 4.1.1 Added the following to paragraph 4.1.1 "Individual tests described . . . upon BAC approval". Page 89 - Paragraph 4.3.2 "Each Multiplexer Programmer shall be individually tested. Tests must be conducted with logic cards inserted." was "The following tests shall be performed on each Multiplexer Programmer shipped." Paragraph 4.3.2.1 Transferred to page 89 after complete revision. Deleted the test procedure specified and replaced it with a requirement that the vendor furnish BAC with the test procedures used. Page 90 - Paragraph 4.3.2.3 Deleted first sentence and replaced with "The tests shall check the Programmer design requirements of section 3.2 for the following Added the following "5. Ability to supply the proper secondary DC voltages which are required by the various multiplexers." Paragraph 4.3.3 First sentence - "Each Multiplexer shall be individually tested." was "The following tests shall be performed on each Multiplexer unit shipped." Third sentence deleted. Paragraph 4.3.3 transferred from page 91. Paragraph 4.3.3.1 Transferred from page 91. New subject, "Test Procedures", replaced "Product Examination" under this paragraph number.	See Rev. page aw								

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H	Page 91 - Paragraph 4.3.3.2 Subject of this paragraph "Product Examination", was subject of paragraph 4.3.3.1. Paragraph 4.3.3.3 New. Subject of this paragraph, "Performance", was subject of paragraph 4.3.3.2. After assigning new paragraph number 4.3.3.3 to this subject the first sentence was deleted and replaced with "The tests shall check the Multiplexer design requirements of Section 3.3 for the following: Added "7. Individual channel data degradation due to current feedback." Paragraph 4.3.4 Transferred from page 92. Rewritten to state requirement for individual testing of each subsystem and to describe each subsystem. Paragraph 4.3.4.1 Transferred from page 92. New subject, "Test Procedures", replaced "Product Examination" under this paragraph number. Page 92 - Paragraph 4.3.4.2 Subject of this paragraph "Product Examination" was subject of paragraph 4.3.4.1. Paragraph 4.3.4.3 New. Subject of this paragraph "Performance" was subject of paragraph 4.3.4.2. After assigning new paragraph number 4.3.4.3 to this subject changed ". . . paragraph 4.3.3.2. .." to read ". . . paragraph 4.3.3.3 . . ." Page 93 - Paragraph 4.3.6 was paragraph 4.3.5. Paragraph 4.3.6.1 was paragraph 4.3.5.1. Paragraph 4.3.6.2 was paragraph 4.3.5.2. "Performance of 10-20402-4, 10-20402-44" was "Performance of 10-20402-4". Deleted "With the test equipment connected as shown in Figure 11 to impose a representative load and ". ". . . compliance of the 10-20402-4, 10-20402-44 Test and Simulation Equipment . . ." was ". . . compliance of the 10-20402-4 Test and Simulation Equipment. . ." Page 94 - Paragraph 4.3.6.2 was paragraph 4.3.5.2. "14. External multiplexer analog input facilities to section 3.5 requirements." was "14. External multiplexer input facilities to section 3.5 requirements." Sub-paragraph 17. Third sentence rewritten to reflect replacement of D2-2444 by GM07-59-2617A.	See Rev. page aw

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/YAR REQUESTED MCR NO. DRAWN CHECKED STRESS APPROVED REL/B-P REL DATE
H	Page 95 - Paragraph 4.3.7 was paragraph 4.3.6. Paragraph 4.3.7.1 was paragraph 4.3.6.1. Paragraph 4.3.7.2 was paragraph 4.3.6.2. Paragraph 4.3.7.3 was paragraph 4.3.6.3. Paragraph 4.3.7.3 In last sentence "4.3.7.2" was "4.3.6.2". Page 96 - Paragraph 4.3.8 was paragraph 4.3.7. Rewritten to specify individual card tests according to procedure recommended by Vendor. Page 97 - Paragraph 4.3.9 was paragraph 4.3.8. Page 100 & 101 - Paragraph 4.5.1.6 Completely revised to reflect replacement of D2-2444 by GM07-59-2617A. Page 101 - Paragraph 4.5.1.6.1 ". . . linear receivers such as those used in STL Document GM07-59-2617A testing . . ." was ". . . linear receivers such as those used in BAC Document D2-2444 testing . . " ". . . of paragraph 4.3.3.2 of STL Document GM07-59-2617A;" was ". . . of paragraph 4.3.3.2 of Boeing Document D2-2444;" Page 103 - Paragraph 4.5.2 At the end of the paragraph added "Figure 22 is to be considered . . . characteristics of a given test require." Paragraph 4.5.2.1.1 ". . . to comply in principle with . . ." was ". . . to comply in all respects with . . ." Page 106 - Paragraph 4.5.2.5.1 Last sentence rewritten to specify 45 minute equipment warmup after temperature stabilization of chamber and before equipment is operated according to paragraph 4.5.2. Paragraph 4.5.2.5.2 (c) ". . . test chamber to 600°F ± 50° . . ." was ". . . test chamber of 600°F ± 50° . . ." Page 107 - Paragraph 4.5.2.5.2 (c) "NOTE: Only one Multiplexer System . . ." was "NOTE: Only Multiplexer Syatem . . ." Page 109 - Paragraph 4.5.2.7 Completely rewritten to reflect replacement of D2-2444 by GM07-59-2617A.	See Rev. page aw

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
H	Page 109a- Added page 109a. Paragraph 4.5.2.7 rewritten continued on this page. Page 119 - Paragraph 6.1.2 "Simulation and Test Equipment (10-20402-4, 10-20402-44)" was "Simulation and Test Equipment (10-20402-4)". Page 120- Paragraph 6.1.2.3 "Failure of the 10-20402-4, 10-20402-44 Simulation and Test Equipment. . ." was "Failure of the 10-20402-4 Simulation and Test Equipment . . ." Page 121 - Paragraph 6.2 Revised paragraph by replacing references to specification drawings with references to the documents D2-10365 and D2-4858 in two places. Page 122 - Paragraph 6.2.5 (a) Deleted "preproduction" Paragraph 6.2.5 (c) revised to read "The article is cleared for system testing and installation on a limited number of non-flight system components." Page 126 - Paragraph 6.3.16 In first sentence "Iteration" was "Interation" In second sentence "commutation" was "cummutation". Page 130 - Paragraph 6.4.4 "Data Required for Tentative and/or Final Approval" was "Date Required for Tentative and/or Final Approval". Page 153 - Figure 11 revised to show new part numbers. Page 164 - Figure 22 revised to show equipment connections in greater detail. Reason for Change: To clarify correct and bring up to date the specification requirements. Revision (H) Change Effective: 003C 004B 004C EWA 3019 EWA 3181 AC01 - AC04 AD01 & on AE01 & on	VAR	W.G. FLEERICK PRR 4500		J.S. MURRAY					

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL	NO.	PAGE
	WS 133A	D10-20402	Rev. aw

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED / MCR NO. / DRAWN / CHECKED / STRESS / APPROVED / REL/S-P / REL DATE
H	Page 68 - Paragraph 3.8 "The logic cards, (10-20402-49 through 10-20402-86) shall be . . ." was "The logic cards, (10-20402-49 through 10-20402-77) shall be . . ." Page 83a - Paragraph 3.8.26 New paragraph. Restated and expanded Voltage and Current Clamp Card description of paragraph 3.8.15. Paragraph 3.8.27 New specification. Amplifier and Clamp Assembly. Paragraph 3.8.28 New specification. 5 Volt Amplifier and Clamp Assembly, Matched. Paragraph 3.8.28.1 New specification. 5 Volt Amplifier and Clamp Assembly, "A" Command Functions, 10-20402-80. Page 83b - Paragraph 3.8.28.2 New specification. 5 Volt Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-83. Paragraph 3.8.28.3 New specification. 5 Volt Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-86. Paragraph 3.8.29 New specification. 50 MV Amplifier and Clamp Assembly, Matched. Paragraph 3.8.29.1 New specification. 50 MV Amplifier and Clamp Assembly, "A" Command Functions, 10-20402-79. Paragraph 3.8.29.2 New specification. 50 MV Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-82. Paragraph 3.8.29.3 New specification. 50 MV Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-85. Page 83c - Paragraph 3.8.30 New specification. 10 MV Amplifier and Clamp Assembly, Matched. Paragraph 3.8.30.1 New specification. 10 MV Amplifier and Clamp Assembly, "A" Command Functions, 10-20402-78.	See Rev. page ax

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR REQUESTED / MCR NO. / DRAWN / CHECKED / STRESS / APPROVED / REL/B-P / REL DATE
H	Page 83c - Paragraph 3.8.30.2 New specification. 10 MV Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-81. Paragraph 3.8.30.3 New specification. 10 MV Amplifier and Clamp Assembly, "B" Command Functions, 10-20402-84. Page 92 - Paragraph 4.3.5 New specification "Final Acceptance Tests" replaced "Individual Tests for 10-20402-4 or 10-20402-44" under this paragraph number. Paragraph 4.3.5.1 New specification "Vibration" replaced "Examination of Product" under this paragraph number. Paragraph 4.3.5.2 New specification "Performance" replaced "Performance of 10-20402-4" under this paragraph number. Page 96 - Paragraph 4.3.8.1 Test Procedure. New specification Paragraph 4.3.8.2 Card Tests. New specification Paragraph 4.3.8.3 Insertion into Sub-System. New specification. Page 113 - Paragraph 4.6.4 Functional Test for Structural Cards 10-20402-45. New specification.	See Rev. page ai.

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	VAR	W.G. FREDERICK	PRR 2305	C.S. MURRAY	3-13-64		3-15-64	3-15-64	
H	Reason for Change: Incorporation of design improvements in specification requirements. Revision (H) Change Effective: 003C 004C EWA 3019 AC01 - AC04 AD01 & on AE01 & on									

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL	NO.	PAGE
	WS 133A	D10-20402	Rev. as

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
J	Reason for Change: Incorporation of Radiation, Inc., exceptions to revision "H". PRR 9500 Unless otherwise specified.									

Page 3, Paragraph 1.5 Change 10-20402-77 to 10-20402-86.

Page 35, Paragraph 3.2.2.1.6 The maximum drain is increased to 2.0 amperes.

Page 37, Paragraph 3.2.2.2.4 Revise plus 5.8 volts to 7.0 volts in the first sentence.

Page 42, Paragraph 3.3.2.2.6 Revised feedback current.

Page 43, Paragraph 3.3.2.2.8 Revised common mode rejection.

Page 67, Paragraph 3.7.2.4 The maximum current drain is increased to 1.15 amperes.

Page 77, Paragraph 3.8.15.4 Clarification of amplifier and clamp re-numbering system.

Page 77, Paragraph 3.8.15.5 Clarification of amplifier and clamp re-numbering system.

Page 77, Paragraph 3.8.15.6 Clarification of amplifier and clamp re-numbering system.

Page 78, Paragraph 3.8.16.2 Clarification of amplifier and clamp re-numbering system.

Page 78, Paragraph 3.8.17.2 Clarification of amplifier and clamp re-numbering system.

Page 79, Paragraph 3.8.18.2 Clarification of amplifier and clamp re-numbering system.

Page 83a, Paragraph 3.8.28 cross reference listed.

Page 83b, Paragraph 3.8.29 cross reference listed.

Page 83c, Paragraph 3.8.30 cross reference listed.

Page 85, Paragraph 3.9.4 and paragraph 3.9.5 added. Mounting bolts revised. (PRR 2482)

Page 90, Paragraph 4.3.2.3 Revised last paragraph regarding feedback limitations.

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DCN'S, ETC.	DEV. VAR.	REQUESTED	MCR NO.	DRAWN	CHECKED	STR.	APPROVED	REL/A-P	REL DATE

PRR 9500 Unless otherwise specified.

J Page 96, Paragraph 4.3.8.2 In the second sentence the word "operating" is changed to "non-operating". Part of paragraph omitted as follows: "Performance shall be monitored and recorded during this test. The cards shall perform without failure or malfunction."

Page 98, Paragraph 4.5.1.4.2 Revised 2nd sentence regarding temperature.

Page 111, Paragraph 4.5.5 Added
Paragraph 4.5.5.1 Added
Paragraph 4.5.5.2 Added
Paragraph 4.5.5.3 Added
Paragraph 4.5.5.4 Added
Paragraph 4.5.5.5 Added

Page 113, Paragraph 4.6.2 Revised
Paragraph 4.6.5 Added
Paragraph 4.6.6 Added
Paragraph 4.6.7 Added
Paragraph 4.6.8 Added

Page 162, Figure 20 has been changed to incorporate the following revisions:

(1) Double shielding on wires between boxes.
(2) Radio frequency shielding of missile ground point wires.
(3) Connect amplifier and sample and hold signal returns to power supply common.
(4) Transformer coupling of "A" and "B" command and reset pulses in programmer.

Reason for Change: To clarify, correct and bring up to date the specification requirements.

Revision J Change Effects: 003C
004B
004C
EWA 3019
EWA 3181
FTM 412 & On

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/G-P	REL DATE
K	PHR 2284 Title Page I - Revised to show Rev. K Title Page II - Revised List of Active Pages Title Page III - Revised List of Active Pages Revision Pages bc thru bf - Added new pages. Page 1, Para. 1.1.1, 1.1.2, 1.1.3, Deleted 10-20402-0,-1, -2. Page 2, Para. 1.2, 1.4, 1.4.1, Deleted 10-20402-4,-6,-7. Page 3, Para. 1.4.2, 1.5, Deleted 10-20402-8, 10-20402-12 thru 10-20402-39 requirements. Page 4, Para. 2.1.1, Deleted MIL-E-005272B. Page 6, Para. 2.2.1, Deleted D5-2288. Page 7, Para. 2.2.1 and 2.2.2, Deleted D2-4751 and 21-50065. Page 8, Para. 3.1, Deleted 10-20402-0. Page 10, Para. 3.1.1.1.9, Added "subparagraph requirements". Page 12, Para. 3.1.1.2.1, Added "See drawing 10-20402". Page 13, Para. 3.1.1.2.6, Deleted last sentence. Page 23, Para. 3.2, Deleted 10-20402-1. Page 25, Para. 3.2.1.1.6, Added "See drawing 10-20402". Para. 3.2.1.1.9, Rewritten to define test points. Para. 3.2.1.1.9.1 & 3.2.1.1.9.2, Deleted entire paragraphs. Page 26, Para. 3.2.1.1.9.3 & 3.2.1.1.9.4, Deleted entire paragraphs. Para. 3.2.1.2.1, Added "See drawing 10-20402". Page 27, Para. 3.2.1.2.6, Deleted "The provisions of --- shall be utilized". Page 32, Para. 3.2.2.1.1 & 3.2.2.1.1.1, Changed "Channel" to "Command" (six places) Page 33, Para. 3.2.2.1.2.2, Changed "micromicrofarads" to "picofarads". Para. 3.2.2.1.4.1, Added "a maximum of". Page 36, Para. 3.2.2.1.9, Added "See drawing 10-20402". Page 37, Para. 3.2.2.2.2.2, Added "See drawing 10-20402". Para. 3.2.2.3, Deleted entire paragraph. Page 38, Para. 3.3, Deleted 10-20402-2 Para. 3.3.1.1.1, 3.3.1.1.2, 3.3.1.1.3, 3.3.1.1.4, 3.3.1.1.5, 3.3.1.2.1, 3.3.1.2.2, 3.3.1.2.3, Delete entire paragraphs. Page 39, Para. 3.3.2.1.2, Deleted "Channel" (2 places). Page 39, ADDED "EXCEPT THAT CHANNELS 91 THROUGH 128 MUST BE 0 TO PLUS 5 VOLTS ONLY. PAGE 86, DELETED PARA "4.3.8" INDEX b DELETED 10-20402-4			SEE REV PAGE bc						

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	W5133A	D10-20402	bc

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
K	Page 31, Para. 3.2.2.1 Added "secondary" before "command pulses" Page 40, Para. 3.3.2.1.3, Replaced "21-50065 and 21-50103" with "21-50105". Para. 3.3.2.1.6.1, Deleted "12800, 6400,3200, 1600" Channel A samples. Deleted "3200,1600" Channel B samples. Deleted last 2 sentences. Page 44, Para. 3.4, Deleted "Design Requirements for 10-20402-3". Page 45, Para. 3.5, Deleted all sentences referring to 10-20402-4. Page 47, Para. 3.5.1.1.8.1, Deleted 10-20402-44 only. Para. 3.5.1.2.1, Added "See drawing 10-20402". Deleted "Filters for 10-20402-44 only". Para. 3.5.1.2.2, Deleted "10-20402-44 only". Page 48, Para. 3.5.1.2.5, Deleted "10-20402-44 only". Page 51, Para. 3.5.2.1.2.2.4, Added last sentence. Para. 3.5.2.1.2.2.4.1 and 3.5.2.1.2.2.4.2, Deleted entire paragraphs. Page 52, Para. 3.5.2.1.3.1, Deleted 10-20402-44 only. Para. 3.5.2.1.3.1.1, Deleted 10-20402-4 requirements. Page 53, Para. 3.5.2.1.3.1.4.1, Deleted entire paragraph. Page 54&55 Para. 3.5.2,1.3.1.4.2, Deleted 3.5.2.1.3.1.4.1 (3 places). Page 64, Para. 3.7, Deleted all sentences pertaining to 10-20402-6. Page 65, Para. 3.7.1.2.1, 3.7.1.2.2, 3.7.1.2.3, and 3.7.1.2.4, Deleted all paragraphs. Page 67, Para. 3.7.2.2, Deleted 6400, 3200, 1600. Deleted last 3 sentences. Page 68 thru 77 Section 3.8, Completely rewritten to define cards in numerical order and delete obsolete cards. Pages 78 thru 83, 83a, 83b, & 83c, Deleted as a result of Section 3.8 rewrite. Page 88, Para. 4.3.1, Changed "Individual" to read "Acceptance" and deleted "10-20402-0". Page 89, Para. 4.3.2 & 4.3.2.1, Deleted entire paragraphs. Page 90 & 91, Section 4.3.2 & 4.3.3, Completely rewritten to reorganize system and card acceptance test requirements. Page 92, Deleted page due to reorganization of Sec. 4.3.2 and 4.3.3 tests. Page 41, Para 3.3.2.19 Replaced "channels" with "input measurements" Page 67, Para. 3.7.2.3 Replaced "35" with "36" Page 163, Figure 21 added Box designations - 1A1, 2A1, 2A2, etc.			SEE REV. PAGE be						

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	WC138A	D10-20402	6d

REV LTR	REVISION	DEV/YAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/BP	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									
K		YAR	W.S. FREDERICK 2-0432	PRR 2981	R.S. WINNIE	Curtis A. Cruz 2/26/62		W.P. Engelhardt 2/26/62	Jan 3/27/62	

Page 93, Section 4.3.4, Deleted 10-20402-4 requirements.
Page 94, Section 4.3.4.2 was 4.3.6.2.
Page 95, Section 4.3.5 was Section 4.3.7.
Page 96, Deleted page due to reorganization of Sec. 4 tests.
Page 97, Para. 4.3.9 deleted.
Para. 4.4.1 changed -0, -1, -2 to be -40, -41, & -42.
Page 106, Para. 4.5.2.4.1, Deleted Acceleration Tests.
Page 113, Para. 4.6.3, Deleted 10-20402-4.
Page 119, Para. 6.1.2, Deleted 10-20402-4.
Page 120, Para. 6.1.2.3, Deleted 10-20402-4.
Page 153, Deleted 10-20402-1,-2,-4,-6,-7, & -8.
Page 156, Deleted 10-20402-0.
Page 159, Deleted -1,-2,-7, & -8.
Page 160, Changed -1, -2, to be -41,-42.

Reason: To include operating limitations (Vendor Deficiency).

Effective: FTM 412 & On.

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
L	PRR 2788 Title Pages I, II & III - Revised to show Rev. L Revision Page bf - Added new page Page 49, Para. 3.5.1.5.1.4, New paragraph to specify elapsed time meter installation on 10-20402-44 Page 71, 72, 73, 74, 75 - Para. 3.8.17, 3.8.18, 3.8.22, 3.8.23, 3.8.26, 3.8.27, Clarified card descriptions Page 90 & 91 - Para. 4.3.2, 4.3.2.3, 4.3.2.3.1, 4.3.2.3.2, Redefined chassis testing Page 91a, Added page due to reorganization of Sec. 4.3.2 tests Reason: To include elapsed time meter requirements and spec. clarification (Completion of Basic Design) Effective: All	VAR	W.G. FREDERICK	PRR 2788	W. E. SMITH						

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL WS-133A	NO. D10-20402	PAGE bf

REV LTR	REVISION	DEV / VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION RERUN DDA'S ETC									
M	PRR 4219 Title Pages I, II & III - Revised to show Rev. M Revision Page bg - Added new page Page 33, para. 3.2.2.1.2.1, rewritten to define positive level. Page 50, para. 3.5.2.1.2.1.1, revised last sentence to include pulse reference exception. Para. 3.5.2.1.2.1.2, added sentence "The condition ..... this specification". Page 154, Figure 12, changed amplitude values +10 and 0 to 0 and -10 respectively. Page 155, Figure 13, changed amplitude values +10 and 0 to 0 and -10 respectively. Reason: Clarification of specification requirements (spec compliance) Effective: All	VAR	W. G. Frederick 2-6422	PRR 4219	D. E. Liston					

THE BOEING COMPANY SEATTLE 24, WASHINGTON	MODEL WS-133A	NO. D10-20402	PAGE bg

REV LTR	REVISION	DEV/VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B-P	REL DATE
	FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC.									

H EWA 30030

Title Pages I, II & III - Revised to show Rev. H and WB133B

Revision Page bh - Added new page

Page 3, Added new paragraph 1.7 defining WB133B 10-20402-90 PGM RF Section requirements.

Page 19, Para. 3.1.2.1.10.4 Changed rise and fall time from "0.3 ± 0.1 microseconds" to be "0.275 ± 0.125 microseconds"

Reason: To revise 10-20402 specification applicability for WB133B and to revise RF Section rise and fall time requirements to agree with hardware (Autonetics D20 and Boeing RF Sections).

Effective: All

DEN
W. G. FREDERICK
EWA 30030
REVISIONS

W G Frederick

BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	MODEL WB-133A WB-133B	NO. D10-20402	PAGE Rev. bh

BAC 1681 A-R2

REV LTR	REVISION FOLLOW DESCRIPTION OF CHANGE WITH: REASON FOR CHANGE, CHANGE EFFECTIVE INFORMATION, PRODUCTION AND TOOLING INFORMATION, RERUN DDA'S, ETC	DEV / VAR	REQUESTED	MCR NO.	DRAWN	CHECKED	STRESS	APPROVED	REL/B.P	REL DATE
P	EWA 30030 Title Pages I, II, & III - Revised to show Revision P. Revision Page bi - added new page. Index b, added para. 4.5.5 "Preproduction Tests for accessory Equipment". Added para. 4.5.6 "Preproduction (Flight Proof) tests for RF Section 10-20402-90 Index d, Figure 24 added Page 4, MIL-D-70327 added to Specification - Military Pages 22a and 22b, Section 3.1.3 "Design Requirements RF Section (10-20402-90)" added to specify design criteria. Page 96, Para. 4.3.6 "Acceptance Tests for 10-20402-90 RF Section" added. Page 111a Section 4.5.6 "Preproduction (Flight Proof) Tests for 10-20402-90" added. (New page) Page 166 Figure 24, "Random Vibration Envelope for Equipment Operative" added. Reason: To include revised vibration levels and separate the design and test requirements of the WS-133A and WS-133B RF Sections to facilitate future revisions. Effective: All (WS-133B)	DEVIATION	W.G. FREDERICK	EWA 30030	R. L. LAVERGNE	H. M. GELLER		W.A. [illegible] 5/8	5-3-63	5-15-63

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TABLE OF CONTENTS

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FIGURE INDEX

FIGURE INDEX (Cont'd)

1. SCOPE

This specification outlines the characteristics and performance requirements of airborne PCM/FM telemetry components for use in R&D flight tests of a ballistic missile. In addition, this specification outlines the characteristics and performance requirements of test equipment for the components, and the requirements of the sled transmitter for R&D sled tests.

1.1 COMPONENT DESCRIPTION

Refer to Boeing Specification Control Drawing 10-20402 for a block diagram which shows the function of each component as an integral part of the complete PCM/FM telemetry system. A general description of individual component operation follows.

1.1.1 RF Section (10-20402-40) K

The RF section shall consist of an RF transmitter, an RF amplifier, and a high voltage power supply to power the RF units as required. As an alternative to an amplifier unit, the RF amplification may be incorporated within the RF transmitter unit. The RF section shall be suitable to accept a serial pulse train from the function programmer (not part of this specification) and produce a frequency modulated RF signal which will in turn be fed to an antenna triplexer (not part of this specification). The mounting structure for the units which comprise the RF section shall provide all of the physical support required for the units, shall contain all inter-unit electrical wiring, and shall provide heat sinks as required.

1.1.2 Multiplexer Programmer (10-20402-41) K

This unit receives primary reset and primary command pulses from the function programmer (not part of this specification), to trigger the operation of the multiplexer units, so as to produce a serial time-shared signal output for encoding by thecoder (not part of this specification). The multiplexer programmer shall be powered directly from the R&D primary power supply batteries, and shall in turn distribute power to the Multiplexer. Any regulation necessary of the R&D primary power shall be incorporated in the multiplexer programmer unit.

1.1.3 Multiplexer (10-20402-42) K

Each multiplexer unit shall consist of a case and plug-in cards, the cards containing the unit switching logic. Each multiplexer unit samples in a programmed sequence the input signals from data sources, and produces a serial time-shared signal output. The unit receives secondary power, command pulses and reset pulses from the multiplexer programmer.

1.2 SIMULATION AND TEST EQUIPMENT (10-20402-44)

The performance of the Multiplexer Programmer and Multiplexer units shall be evaluated while operating as a subsystem, as opposed to individual performance tests for these units. During the subsystem tests, the simulation unit shall generate primary reset pulses, primary command pulses and analog simulation and shall provide primary power for the subsystem. The test equipment shall be capable of verifying that selected subsystem operation requirements are within the performance limits defined.

1.3 SLED TRANSMITTER SYSTEM (10-20402-5)

The sled mounted transmitter is required for Holloman AFB R&D sled tests operating in the 800 to 828 mc band. Refer to Figure (18) for block diagram of Holloman AFB sled mounted PCM/FM system. The -5 system identification is used for specification clarity to describe the combined operation of the -9, -10, and -11 units.

1.3.1 Exciter Unit (10-20402-9)

The exciter is a -0 transmitter modified to operate in the 200 to 207 mc band.

1.3.2 Multiplier and Amplifier Unit (10-20402-10)

This unit consists of three packages mounted on a single chassis. The unit is used to transform the output of the -9 exciter unit to the 800 to 828 mc band.

1.3.3 Power Supply (10-20402-11)

This unit supplies the required power to the -10 unit from the 28 VDC sled primary power supply.

1.4 MULTIPLEXER SYSTEM (10-20402-46)

The Multiplexer System consists of one Multiplexer Control Box and a maximum of three Auxiliary Boxes. The 10-20402-46 system identification is used solely for specification clarity to describe the combined operation of the Control and Auxiliary units including Logic Cards. The system functions in the same manner as that of a Multiplexer unit described in 1.1.3.

1.4.1 Control Box (10-20402-47)

The Multiplexer Control Box receives secondary reset and command pulses from the Programmer to trigger the operation of each Auxiliary Box. The control box shall produce serial pulse train(s) for the programmer. The Control Box shall operate with one, two, or three Auxiliary Boxes within the limits specified in paragraph 3.2.2.1.9.

1.4.2 Auxiliary Box (10-20402-48)

The Auxiliary Box shall include the cards containing switching logic. Each Auxiliary Box samples as programmed input signals from data sources and feeds these signals to the Control Box.

1.5 LOGIC CARDS (10-20402-49 through 10-20402-86)

The Logic Cards are modular plug-in assemblies which contain the command, gating, timing, amplification, power, and/or matching circuitry necessary to provide the required functional capabilities of the Multiplexer Programmer, Multiplexer, Control Box, and Auxiliary Box.

1.6 ACCESSORY EQUIPMENT

The accessory equipment includes special tools and equipment items which do not fall within the classification of Logic Cards or major functional equipment. Specific descriptions of equipment included in this classification are given in Section 3.9.

1.7 RF Section (10-20402-90)

The RF Section is identical to 10-20402-40 except for vendor internal RF Section design. The requirements for 10-20402-90 are identical to the 10-20402-40 requirements as specified in Sections 1, 2, 3, 4, 5 and 6 of this document.

2. APPLICABLE DOCUMENTS

2.1 GOVERNMENT DOCUMENTS

The following government documents of the exact issue noted, together with the noted revisions thereto constitute a part of this specification, but only to the extent defined herein. In those cases where the document listed is not dated, the issue in effect on the date of invitation for bids, shall form a part of this specification. Where conflicting requirements exist, the requirements of this specification shall govern.

2.1.1 Specification - Military

MIL-E-4158B	"Electronic Equipment Ground: General Requirements for" dated 3 January 1958.
MIL-E-4682B	"Electron Tubes, Choice and Application of" dated 11 January 1956.
MIL-D-5028B	"Drawing and Data Lists, Preparation of Manufacturers", dated 20 August 1956.
MIL-E-5400C	"Electronic Equipment, Aircraft, General Specification for", dated 15 July 1958.
MIL-D-5480C	"Data, Engineering and Technical (Reproduction Thereof)", dated 29 September 1954.
MIL-T-9107	"Test Reports, Preparation of", dated 13 July 1953.
MIL-F-14072	"Finishes for Ground Signal Equipment", dated 25 May 1955.
MIL-D-70327	"Drawings, Engineering and Associated Lists", dated 16 March 1959.

	MIL-C-25050	"Colors, Aeronautical Lights and Lighting Equipment, General Requirements for" dated 29 October 1954.
2.1.2	**Standards**	
	FED-STD-595	"Colors" dated 1 March 1956
	MIL-STD-12B	"Abbreviations for Use on Drawings" dated 11 March 1952.
	MIL-STD-28	"Approved Method for Assignment of Drawing Titles", dated 2 June 1958.
	MIL-STD-129B	"Marking for Shipment and Storage" dated 10 April 1957 with Change Notice -1 dated 6 January 1958.
	MIL-STD-130A	"Identification Marking of U.S. Military Property" dated 8 September 1958.

2.1.3 Publications

Deleted

ANA Bulletin 143d — "Specification and Standards", Use of, dated 19 August 1954.

ANA Bulletin 405 — "Storage Life - Aeronautical Articles", dated September 21, 1951, including amendment 3 dated July 20, 1956.

2.1.4 Drawings

Deleted

2.2 NON-GOVERNMENT DOCUMENTS

The following non-government documents, of the exact issues shown, form a part of this specification to the extent specified herein. In these cases where the document is not dated, the latest issue in effect on the date of invitation for bids shall form a part of this specification. One copy each of the documents listed below and marked with an asterisk is to be furnished with each copy of this specification being sent to a vendor. Where conflicting requirements exist, the requirements of this specification shall govern.

2.2.1 Publications

* BAC 5306 — Boeing Process Specification "Manufacture of Decalcomanias & for Marking Panels with a Silk Screen".

* BMS 10-26 — Boeing Material Specification "Pressure Sensitive Plastic Film Decalcomania"

* GM07-59-2617A — STL Document "Electro Interference Control Requirements for Minuteman"

* D2-4051 — Boeing Document "Protective Finish Performance Document for Model WB 133A"

* D2-4123 — Boeing Document "Statement of Work for sub-contract for airborne PCM/FM Telemetry System Components"

DELETED

* D5-2300 — Boeing Document "Packaging Requirements-Bomarc Missile"

	D2-7687	Boeing Document, "Electrical Assembly and Packaging Requirements for Airborne PCM/FM Multiplexer Equipment"
	D2-4861	Boeing Document, "Functional Test Procedure for PCM/FM Airborne Telemetry System"
	D2-5051	Boeing Document, "Functional Test Procedure for Simulation and Test Equipment 10-20402-44"
		DELETED
	D2-9129	Boeing Document, "Airborne PCM/FM Telemetry Equipment, Approved Parts and Components"
	D2-10365	Equipment Certification and Clearance Data for PCM/FM Telemetry Components.
	D2-4858	Status Report Qualification and Approval Program Minuteman Weapon System
	Drawings	
2.2.2	* 10-20402	Boeing Drawing, "Specification for Airborne PCM/FM Telemetry System Components"
	* 21-50000	Boeing Drawing, "PCM/FM Airborne Telemetry Program Control Drawing".
		DELETED
	* 21-50105	Boeing Drawing "PCM/FM Airborne Telemetry Program Control Drawing - Test Matrix MT"
2.2.3	References	
	2-4446-8-364	"Assigned frequency for PCM/FM Telemetry Transmitter" (Confidential) dated August 13, 1959.

3.0 REQUIREMENTS

3.1 DESIGN REQUIREMENTS RF SECTION

The requirements set forth herein describe the RF Section (10-20402-40) for an airborne PCM/FM telemetry system.

3.1.1 General Requirements

3.1.1.1 Physical Requirements

3.1.1.1.1 Selection of Specification and Standards - Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with ANA Bulletin 143, except as provided in paragraphs 3.1.1.1.1.1 and 3.1.1.1.1.2.

3.1.1.1.1.1 Commercial Parts - Commercial parts having suitable properties may be used where, on the date of invitation for bids, there are no suitable standard parts. In any case, commercial utility parts like screws, bolts, nuts, cotter pins, etc. having suitable properties may be used provided:

(a) They can be replaced by the standard parts (MS or AN) without alteration.

(b) The corresponding standard part numbers are referenced in the parts list and, on the Vendor's drawings.

3.1.1.1.1.2 Standard Parts - With the exception in paragraph 3.1.1.1.1.1, MS and AN Standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

3.1.1.1.2 Materials and Processes - All materials and processes used shall be in accordance with government material and process specifications wherever applicable. Where the vendor finds it necessary or desirable to use materials or processes not covered by government specifications, they shall be entirely suitable for the purpose. The use of lightweight materials, weight and space saving designs is a major consideration and their use shall be investigated and exploited to the greatest possible extent.

3.1.1.1.2.1 Deleted

3.1.1.1.2.2 Fungus-proof Materials - Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used, they shall be treated with a fungicidal agent acceptable to BAC.

3.1.1.1.2.3 Finishes - Surfaces shall meet the applicable finish requirements specified ~~in D6-4051~~. A

3.1.1.1.2.3.1 Similar and Dissimilar Metals

Similar and dissimilar metals shall be grouped in accordance with MIL-F-14072. The usage of dissimilar metals shall be in accordance with MIL-E-5400C. A

3.1.1.1.3 Producibility - The design shall allow the use of such methods and processes as will result in maximum production with a minimum expenditure of manhours and materials, commensurate with the quality requirements unique to the individual model or type.

3.1.1.1.4 Maintainability - Maintainability shall be considered as a design factor along with other major design parameters. The design shall provide for simple and rapid installation or removal of units from the equipment mounting structure (Refer to Boeing Drawing 10-20402) without disturbing or damaging interconnecting wiring and connectors, and without special tools or equipment. If a box type structure is utilized, the cover shall be removed without special tools. Any gaskets utilized with the cover shall be secured to the cover to prevent loss of, or damage to, the gasket upon removal of the cover.

3.1.1.1.5 Workmanship - The equipment shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from defects of solder joints, connectors, conductors, insulation and printed circuits; proper wiring supports, circuit arrangement and conductor spacing; and cleanliness during and after assembly. Attention shall also be given to freedom from blemishes, defects, burrs, and sharp edges, accuracy of dimensions; radii of fillets and working of parts. BAC Document D5-2300 is applicable.

3.1.1.1.6 Interchangeability - Articles and/or components manufactured in accordance with this specification shall be functionally, physically, and structurally interchangeable. See paragraph 3.1.1.5.3 for part number changes for non-interchangeable articles.

3.1.1.1.7 Construction - The construction of the equipment shall be adequate to obtain the required performance and reliability under the conditions of this specification. Modular construction shall be used to the greatest extent possible, and each unit as specified in paragraph 1.1.1 shall be a plug-in type unit. The RF unit mounting structure may be utilized to serve as a heat sink and/or function as an RF shield, however the use of the RF package mounting surface as a heat sink (except during bench operation) shall not be contemplated. See paragraph 3.1.2.1.1. The removal of any outer insulation skin for the purposes of bench tests is permitted, however, the removal of the insulation skin shall not expose internal components to possible damage by handling, or in any way reduce shielding. If the unit is not sealed, suitable provisions for drainage shall be incorporated to prevent the accumulation of moisture. (F)

3.1.1.1.8 Components - The power supply unit shall contain only solid state components. Vacuum tubes and moving parts except for factory set adjustments, are prohibited. In the RF transmitter-amplifier unit or units, solid state components in proven, conservatively designed circuits shall be used to the greatest possible extent. All parts shall be chosen to provide high reliability and consistent performance in system operation.

3.1.1.1.9 Test Points - Care must be taken in providing electrical test points to ensure that the external loads (such as cable capacitance or inadvertent shorts) introduced by the testing activities does not cause damage to the RF section or units under test. Electrical test points available for use in RF section testing shall be sufficient to isolate a fault to a major component plug-in unit. Test points shall include but are not limited to the following subparagraph requirements. K

3.1.1.1.9.1 The RF section shall have test points to monitor the input signal waveform, and potential.

3.1.1.1.9.2 The high voltage power supply shall have test points to monitor the high voltage potential output.

3.1.1.1.9.3 Deleted (F)

3.1.1.1.10 Physical Size - Maximum envelope limits and installation mounting facilities for the equipment shall be in accordance with the Boeing Specification Control Drawing 10-20402. All case protrusions shall be contained within the maximum envelope limits. A

3.1.1.1.11 Weight - The weight of the equipment shall be the minimum consistent with the requirements of this specification and within the limitations of sound design. Weight economy is of prime importance in the design of all flight articles. The maximum weight entered on the Boeing specification control drawing shall not be exceeded.

3.1.1.2 Electrical Requirements

3.1.1.2.1 Electrical Interference Suppression - The equipment shall meet the requirements of STL Document GM07-59-2617A. The equipment is defined as Class 1 per GM07-59-2617A. See Drawing 10-20402.

3.1.1.2.2 Dielectric Strength - The equipment shall be capable of withstanding the non-operative environmental conditions of section 3.1.1.3.1, and shall be capable of operation under the operative environmental conditions of section 3.1.1.3.2, without failure or malfunction.

3.1.1.2.3 Electrical Connections - Connectors into the equipment from power source, input signals and antenna shall be located as shown, and shall be of the type specified, on BAC Drawing 10-20402. Connectors on plug-in components shall be Cannon type DA or DE modified to include a moisture seal. Part numbers of modified connectors will be specified at a later date. RF connectors utilized within the assembly shall be BAC approved.

3.1.1.2.4 Internal Wiring - Internal wiring shall consist of printed circuits to the maximum possible extent and shall be securely fastened to the mounting structure. Any electrical wire used shall be in accordance with an appropriate military specification and shall be insulated with cold flow resistant dielectric.

3.1.1.2.5 Electronic Parts List - The Vendor must submit to BAC for approval a complete list of the type and manufacturer of all electronic parts. BAC Document D2-9129 is applicable.

3.1.1.2.6 Grounding - Single point grounding external to the equipment package is to be employed for all circuits except those circuits of the RF section. Circuits within the equipment package shall be isolated from equipment cases and base as described below.

Transmitter-Power Amplifier: A minimum DC isolation of one megohm shall exist between case ground and all modulation signal input terminals (leads).

High Voltage Power Supply: A minimum isolation of one megohm shall exist between (1) input terminals (leads) and case ground, (2) output terminals and case ground, and (3) input terminals and output terminals.

Individual signal, power, and case grounding is required and separate ground leads shall be provided through connector.

3.1.1.2.6 (Cont'd) pins except where signal and power leads must have a common ground due to the basic circuit design. The provisions of GM07-59-2617A paragraph 3.2.9.1 apply.

3.1.1.2.7 Bonding - The provision of GM07-59-2617A, paragraphs 3.2.3 and 3.2.4 apply. Electrical bonding shall be provided between all unit cases and the unit mounting structure. A direct metal to metal contact with the two surfaces held together by positive pressure is preferred. For the power supply unit, bonding may be accomplished through one of the component connector pins. A bonding strap may be used on the RF units in lieu of metal to metal contact.

3.1.1.3 Environmental Conditions

3.1.1.3.1 Non-Operative Conditions - While out of shipping container, the equipment shall be capable of satisfying the performance requirements of section 3.1.2.2 after being subjected to the following environmental conditions.

3.1.1.3.1.1 Temperature-Altitude - An ambient pressure-altitude range of sea level to 20,000 feet as encountered during air transport and air temperature ranging from a minimum of -45°F (-43°C) to a maximum of plus 160°F (71°C), under unsheltered ground conditions. (This figure is based on a free air temperature of 125°F increased by 35°F solar radiative heating of a packing case or enclosure.) The air temperature may change at rates up to 1.8°F(1.0°C) per second.

3.1.1.3.1.2 Vibration - Complex vibration (including sinusoids and random noise) of which the combined maximum is represented by the sinusoidal vibration envelope of Figure 3.

3.1.1.3.1.3 Humidity - Relative humidity to 100% with conditions such that condensation takes place in the form of water or frost.

3.1.1.3.1.4 Shock - Shocks involved in free drops of up to 1 inch and pivot drops up to 4 inches. Corresponding acceleration peaks may be 100g.

3.1.1.3.1.5 Sand and Dust - Exposure to sand and dust as encountered in desert areas.

3.1.1.3.1.5.1 With the Technical Progress Reports required by D2-4123, the vendor shall submit a report concerning the packaging of equipment to withstand this environmental condition. Packaging shall be subject to BAC approval.

3.1.1.3.1.6 Salt Spray - Exposure to salt sea atmosphere as encountered in sea coast areas. Paragraph 3.1.1.3.1.5.1 is applicable.

3.1.1.3.1.7 Fungus - Fungus growth as encountered in tropical climates. Paragraphs 3.1.1.1.2.2 and 3.1.1.3.1.5.1 are applicable.

3.1.1.3.2 Operative Conditions - The equipment shall be capable of satisfying the performance requirements of section 3.1.2.2 while being subjected to the following environmental conditions:

3.1.1.3.2.1 Temperature-Altitude - An ambient pressure-altitude change from sea level to 200,000 feet altitude within 1.5 minutes followed by a constant pressure-altitude of 200,000 feet for 3.5 minutes. Within one minute after missile launch, the equipment will be subjected to 600°F thermal radiation from external compartment walls. The duration of the 600°F thermal radiation will be about 3 minutes. There will be provisions for ground cooling to an ambient compartment temperature of +65°F during the pre-launch period.

3.1.1.3.2.2 Vibration - Complex vibration including sinusoids as represented by the vibration envelope of Figure 4 and random noise as represented by the vibration envelope of Figure 5.

3.1.1.3.2.3 Humidity - Relative humidity to 100%

3.1.1.3.2.4 Shock - Shocks caused by missile engine ignition and cutoff. Excitation of equipment due to shock is considered covered in paragraph 3.1.1.3.2.2.

3.1.1.3.2.5 Acceleration - Sustained acceleration of 15g maximum in each of 3 mutually perpendicular axes.

3.1.1.3.2.6 Acoustical Field - Sound pressure levels of 140 db RMS (RE 0.0002 d/cm^2). overall (37 1/2 - 4800 cps) Random. E

3.1.1.3.2.7 Angular Oscillation - Maximum and rms excursions as follows about each of three mutually perpendicular axes.

Frequency Range	Maximum Excursion	RMS Excursion
0.5 to 1 cps	1 degree	0.30 degree
1 to 3 cps	0.5 degree	0.15 degree
3 to 12 cps	0.1 degree	0.03 degree
Above 12 cps	Determined by local mounting conditions.	

3.1.1.4 Reliability

Reliability shall be considered as a design factor on an equal basis with other design criteria such as performance, weight, and cost. The reliability of the article shall be such that when integrated into the system of which it is a part, it will perform its design function throughout its required life.

3.1.1.4.1 Reliability Requirement - The reliability of each telemetry system is defined as the probability of successful operation for 30 minutes of ground environmental conditions followed immediately by successful operation for 5 minutes while being subjected to flight environmental conditions.

3.1.1.5 Identification of Product

The information specified shall be permanently marked on the article, using materials and/or processes that will insure legibility during the expected life of the article and the preproduction tests of section 4.0. Identification marking of the article shall conform to MIL-STD-130A, except that spaces for marking stock number, registration number, date of manufacture, contractor order number, and weight may be left blank. The vendor's part number shall completely identify the article in the last 12 or less digits. In accordance with MIL-STD-130A, the transmitter-amplifier unit or units, and the power supply unit shall be identified by individual part numbers.

3.1.1.5.1 Boeing Part Number - The Boeing specification control part number shall not be permanently marked on the article nor shall it be contained in any part of the vendors part number.

To facilitate BAC handling a separate and easily removable tag or adhesive label bearing the BAC part number shown on the specification control drawing shall be affixed to the article. A tag shall not be attached through a mounting hole.

3.1.1.5.2 Serial Numbering - Articles manufactured in accordance with this specification shall bear serial numbers assigned by the vendor. The serial numbering system is the option of the vendor. A

3.1.1.5.3 Part Number Changes - Articles which completely satisfy the requirements of this specification shall be assigned a specific vendor part number. Articles which do not completely satisfy the requirements of this specification shall be differentiated from those that do, by a different vendor part number. In addition, different Boeing dash numbers may be assigned to distinguish parts not completely satisfying the requirements of this specification. After final approval of the article by BAC, the part number assigned by the vendor shall be positive identification such that the article and/or components may be procured by vendor part number alone without reference to this specification. Changes in the article, and/or components whether initiated by BAC or the vendor, which affect functional, physical, or structural interchangeability shall always be attended by a change in vendor's part number to identify the new configuration. The Drawing's number requirements of Specification MIL-D-5028B shall govern changes in the manufacturer's part numbers.

3.1.2 Detailed Requirements

3.1.2.1 RF Section Design Requirements

The design of the RF section shall be adequate to obtain the required performance stated in section 3.1.2.2 and the reliability requirements as stated in paragraph 3.1.1.4.1, and shall take into consideration possible degradation of performance due to production variations, environmental conditions and aging.

3.1.2.1.1 Cooling - The equipment may be operated for as long as 36 consecutive hours on the bench at an ambient temperature of 80°F with external cooling such as a cold plate or blower if necessary. During the pre-launch period, ground cooling facilities will be available to maintain the equipment ambient temperature at approximately 65°F. These ground cooling facilities will supply 25 pounds of air per minute at about 45°F to the instrumentation section and will be available until 10 seconds before launch. Cooling air will not be ducted into any of the components. During flight, there shall be no external cooling system for the equipment. The unit shall therefore be designed and protected as necessary to perform within the limits specified while being subjected to the temperature-altitude environmental conditions as described in paragraph 3.1.1.3.2.1.

3.1.2.1.2 Interdependence - The design of the units shall be such that failures will be contained in the faulty unit and will not cause damage in other units.

(a) Loss of power supply shall not damage the transmitter.
(b) Loss of excitation shall not result in power amplifier tube failure.

3.1.2.1.3 Power Source - The RF section shall operate from 28 ± 2 volt D-C power system containing maximum electrical interference components as set forth in the test requirements of paragraph 4.5.2.7. Paragraph 3.2.1.2.1 is applicable. The power system negative lead will be grounded external to the unit. Maximum current drain shall not exceed 4.45 amp. The RF section secondary power supplies and converters shall be designed to provide against the effects of accidental output shorts without damage to the converter. Fuses or circuits breakers will not beutilized in the design. The power source impedances will be as follows:

(a) Ground Power - 0.5 ohms or less, DC
0.2 ohms from 2 cycles to 10 Kc
0.2 ohms to 1.0 ohm linearly from 10 Kc to 100 Kc

Ground operation power will be supplied by a T.R. unit operating from 60 cycle line power. The T.R. unit output will be 28 V DC ± 2 volts with maximum ripple limited to ± 1% (peak to peak).

3.1.2.1.3 (cont)- (b) Airborne Power - The airborne PCM/FM primary power supply is a battery containing approximately 20 cells. The load on this power supply is approximately 14 amperes. The internal impedance of the battery varies with both time and load. The calculated nominal initial internal impedance of the battery with a 14A load is 0.73 ohms decreasing to 0.65 ohms between 2 and 3 minutes operation. Allowances for cell variation, 30 day stand time and temperature variation will cause maximum and minimum initial impedance values of 0.9 ohms and 0.65 ohms.

3.1.2.1.4 Adjustments - The equipment shall operate within the tolerances specified herein during the entire operational life of the equipment while being subjected to the environmental conditions specified without adjustment or tuning, with the exception of the adjustments permitted in section 3.1.2.2.3. Any adjustment controls utilized by the vendor shall be positively locked and sealed prior to delivery. Such adjustments (with exception of those permitted in section 3.1.2.2.3) shall not be accessible without disassembly of the plug-in components. Signal inputs and input voltage controls such as switches or relays shall not be utilized.

3.1.2.1.5 The RF section transmitter shall be crystal stabilized.

3.1.2.1.6 Deleted (F)

3.1.2.1.7 Center Frequency - The center frequency of the RF section shall be in the 225 to 260 megacycles band.

3.1.2.1.8 Modulation - Deleted G

3.1.2.1.9 Feedback Ripple - The unit shall contain adequate filtering at its input terminals to eliminate any feedback ripple greater than 1.00% of the primary voltage to the primary power source. The current feedback ripple shall not exceed 1.00% peak of average load current drain throughout the ripple frequency domain. A

3.1.2.1.10 RF Modulating Signal - The transmitter unit of the RF section shall be capable of being frequency modulated by a serial pulse train from the function programmer (not part of this specification). The characteristics of the pulse train are as follows: See Figure 13 for typical signal wave form.

3.1.2.1.10.1 Wave Form - The wave form will consist of non-return-to-zero bits, where the positive level indicates the absence of a pulse, and the negative level indicates the presence of a pulse.

3.1.2.1.10.2 Pulse Frequency - The nominal modulating frequency will be 172.8 kc ± 1%. This assumes an alternate "1"-"0" NRZ bit pattern of 345.6 kilo bits per second ± 1%.

3.1.2.1.10.3 Pulse Amplitude - The pulse amplitude will be two volts ± 3% with the positive voltage level at ground reference.

3.1.2.1.10.4 Rise and Fall Time - The rise time and the fall time will be 0.275±0.125 micro seconds when driving a 52 ± 0.1% ohm load. (F) N

3.1.2.1.11 Bandwidth - Side bands of the modulated RF carrier signal containing at least 99% of the total output power shall be contained within the lmc band. Any one side band outside the above defined band may not exceed 0.25% of the total output power. A G

3.1.2.1.12 Transient Potentials - The design of the equipment shall be such as to withstand voltage transients in the power system of 28 ± 12 volts for a maximum duration of 25 milliseconds. A

3.1.2.20 RF Section Performance Requirements

With power supplied in accordance with paragraph 3.1.2.1.3 and input signals in accord with section 3.1.2.1.10 the RF section shall satisfy the following performance requirements:

3.1.2.2.1 Life - The equipment total operating life shall be 500 hours. (Mainly, this life will be accumulated on the bench in normal ambient environment and as installed in the missile in the launching revetment. The equipment will operate at all times during the missile's flight life and will be used to obtain data from a time several minutes prior to first missile motion until flight termination.)

3.1.2.2.2 Deleted

3.1.2.2.3 Power Output - Once adjusted to the frequency specified in paragraph 3.1.2.2.7, and when operating into a load whose impedance lies on or within a VSWR circle of 2.0 on a Smith Chart normalized to 50 ohms, the power output shall be a minimum of 13 watts and shall not exceed 18 watts without any further adjustment. Two screwdriver type adjustments may be employed in the RF output circuit and they shall be capable of being positively locked. Any maladjustment during bench operation shall not damage the transmitter. Environmental stresses as defined by section 3.1.1.3 shallnot alter tuning after adjustment has been made.

3.1.2.2.3.1 During ground operation and while operating into a load causing a VSWR of 5:1, power output may drop to a minimum of 1 watt. The carrier frequency shall remain with the specified stability in paragraph 3.1.2.2.6. The RF Section will not be damaged while operating in the above condition for a period of two hours.

3.1.2.2.4 Linearity - The power output shall be constant within ± 0.5 db over the maximum transmitter deviation.

3.1.2.2.5 Spurious Radiation - With the exception of the allocated missile receiver passbands, all spurious antenna conducted signals shall be at least 60 db below the unmodulated carrier level. Spurious antenna conducted signals in the allocated receiver passbands shall be at least 102 db below the unmodulated carrier level; the receiver passbands are as follows: 405-420 mc; 4.9-5.7 Kmc. Should a filter be required to satisfy the above requirement, the filter shall be fully contained within a separate module to facilitate filter removal and substitution.

3.1.2.2.6 Stability - The modulated carrier frequency shall be stable to within ± 0.01%, including the center frequency tolerance as specified in paragraph 3.1.2.2.7.

3.1.2.2.7 Center Frequency - The center frequency shall be within ± 0.005% of the frequency specified. The center frequency is specified in the reference letter, paragraph 2.2.3. (The center frequency is defined as that assigned frequency to which all references to deviation and modulation are made.) (F)

3.1.2.2.8 Modulation Filter Characteristics - The modulating filter shall be a low pass filter with cut-off at approximately 250 kc and a "roll-off" of approximately 18 db/octave. (F)

3.1.2.2.9 **Modulation Input Sensitivity** - The RF section shall have a deviation sensitivity of 140 ±10%/volt (peak). The RF section shall be modulated by a serial NRZ pulse train of "ones" and "zeros", fed to the modulating filter, with a "one" being represented by a -2 volt (peak-to-peak) signal and a "zero" represented by zero volts. A "one" shall cause an RF carrier deviation of 140 kc in the higher frequency direction (140 kc above the carrier center frequency) and a "zero" shall cause an RF carrier deviation of 140 kc in the lower frequency direction (140 kc below the carrier center frequency). The deviation shall not exceed ± 140 kc when modulated by pulses having amplitude tolerances specified in paragraph 3.1.2.1.10.3.

3.1.2.2.10 **Primary Power Variation** - The RF section shall meet the performance requirements specified in this section during system input voltage variations between 26 to 30 volts dc.

3.1.3 DESIGN REQUIREMENTS OF SECTION (10-20402-90)

3.1.3.1 General Requirements

3.1.3.1.1 Physical Requirements

All of the general physical requirements specified in sections 3.1.1.1 are applicable with the exception of paragraph 3.1.1.1.9.2.

3.1.3.1.2 Electrical Requirements

All of the general electrical requirements specified in sections 3.1.1.2 are applicable.

3.1.3.1.3 Environmental Conditions

All of the general environmental conditions of sections 3.1.1.3 are applicable with the exception of paragraphs 3.1.1.3.2.2.

3.1.3.1.3.1 Vibration - Complex vibrations including random vibration as described by the envelope of Figure 24 and simsoidal vibration as described by the envelope of Figure 4 apply.

3.1.3.1.4 Reliability

The reliability requirements of 3.1.1.4 apply.

3.1.3.1.5 Identification of Product

All of the identification requirements of 3.1.1.5 apply except paragraph 3.1.1.5.3.

3.1.3.1.5.1 Part Number Changes - Articles which completely satisfy the requirements of this specification shall be assigned a specific vendor part number. Articles which do not completely satisfy the requirements of this specification shall be differentiated from those that do, by a different vendor part number. In addition, different Boeing dash numbers may not be assigned to distinguish parts not completely satisfying the requirements of this specification. After final approval of the article by Boeing, the part number assigned by the vendor shall be positive identification such that the article and/or components may be procured by vendor part number alone without reference to this specification. Changes in the article, and/or components whether initiated by Boeing or the vendor, which affect functional, physical, or structural interchangeability shall always be attended by a change in vendor's part number to identify the new configuration.

3.1.3.1.5.1 (Continued)

New drawings, requiring new drawing numbers, shall be drawn in accordance with MIL-D-70327.

3.1.3.2 Detail Requirements

All of the detail requirements of sections 3.1.2 are applicable.

3.2 **DESIGN REQUIREMENTS - MULTIPLEXER PROGRAMMER AND LOGIC CARDS**

The requirements set forth herein describe the design requirements for Multiplexer Programmer (. (10-20402-41) for an airborne PCM/FM telemetry system. Specific dash numbers are assigned to the Logic Cards in section 3.8. G K

3.2.1 General Requirements

3.2.1.1 Physical Requirements G

3.2.1.1.1 Selection of Specification and Standards - Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with ANA Bulletin 143, except as provided in paragraphs 3.2.1.1.1.1 and 3.2.1.1.-1.2. G

3.2.1.1.1.1 Commercial Parts - Commercial parts having suitable properties may be used where, on the date of the invitation for bids, there are no suitable standard parts. In any case, commercial utility parts like screws, bolts, nuts, cotter pins, etc. having suitable properties may be used provided: C

(a) They can be replaced by the standard parts (MS or AN) without alteration.
(b) The corresponding standard part numbers are referenced in the parts list and, on the Vendor's drawings.

3.2.1.1.1.2 Standard Parts - With the exception in paragraph 3.2.1.1.1.1, MS and AN Standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers. C

3.2.1.1.2 Materials and Processes - All materials and processes used shall be in accordance with government material and process specifications wherever applicable. Where the vendor finds it necessary or desirable to use materials or processes not covered by government specifications, they shall be entirely suitable for the purpose. The use of lightweight materials, weight and space saving designs is a major consideration and their use shall be investigated and exploited to the greatest possible extent. C

3.2.1.1.2.1 Fungus-proof Materials - Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used, they shall be treated with a fungicidal agent acceptable to BAC.

3.2.1.1.2.2 Finishes - Surfaces shall meet the applicable finish requirements specified in D2-4051.

3.2.1.1.2.3 Similar and Dissimilar Metals - Similar and dissimilar metals shall be grouped in accordance with MIL-F-14072. The usage of dissimilar metals shall be in accordance with MIL-E-5400C.

3.2.1.1.3 Producibility - The design shall allow the use of such methods and processes as will result in maximum production with a minimum expenditure of manhours and materials, commensurate with the quality requirements unique to the individual model or type.

3.2.1.1.4 Maintainability - Maintainability shall be considered as a design factor along with other major design parameters. The design shall provide for simple and rapid installation or removal of the unit with a minimum of special tools or handling equipment. The design shall also provide for simple installation or removal of modules from the unit without disturbing or damaging interconnecting wiring and connectors. Covers shall be fastened with the minimum number of screws or bolts necessary to comply with the physical stress requirements of this specification.

3.2.1.1.5 Workmanship - The equipment shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from defects of solder joints, connectors, conductors, insulation and printed circuits; proper wiring supports, circuit arrangement and conductor spacing; and cleanliness during and after assembly. Attention shall also be given to freedom from blemishes, defects, burrs, and sharp edges, accuracy of dimensions; radii of fillets and working of parts. BAC Document D2-7667 is applicable.

3.2.1.1.6 Interchangeability - Articles and/or components manufactured

3.2.1.1.6 (Cont'd)
in accordance with this specification shall be functionally, physically, and structurally interchangeable. See paragraph 3.2.1.5.3 for part number changes for non-interchangeable articles. See Drawing 10-20402.

3.2.1.1.7 Construction - The construction of the equipment shall be adequate to obtain the required performance and reliability. Construction of the sub-units shall be modular to the greatest possible extent. The use of printed circuit cards to contain the Programmer switching logic shall be exploited in the interests of maximum flexibility.

3.2.1.1.8 Components - The unit shall contain only solid state components. Vacuum tubes, moving parts and adjustable components are prohibited. All parts shall be chosen to provide high reliability and consistent performance.

3.2.1.1.9 Test Points - Where printed circuit cards are employed, extension cards shall be provided as special test equipment. The extension cards shall serve to bring out beyond the case perimeter, the exposed circuit points of the case which are normally inaccessible. The extension cards shall accommodate plug-in modules, which will be checked out during dynamic testing. If all logic circuitry is accessible by extension cards, test points are not required.

3.2.1.1.10 Physical Size - Maximum envelope limits and installation mounting facilities for the equipment shall be in accordance with Boeing Specification Control Drawing 10-20402.

3.2.1.1.11 Weight - The weight of the equipment shall be the minimum consistent with the requirements of this specification and within the limitations of sound design. Weight economy is of prime importance in the design of all flight articles. The maximum weight entered on the Boeing specification control drawing shall not be exceeded.

3.2.1.2 Electrical Requirements

3.2.1.2.1 Electrical Interference Suppression - The equipment shall meet the requirements of STL Document GM07-59-2617A. The equipment is defined as Class I per GM07-59-2617A. See Drawing 10-20402. K

3.2.1.2.2 Dielectric Strength - The equipment shall be capable of withstanding the non-operative environmental conditions of section 3.2.1.3.1, and shall be capable of operation under the operative environmental conditions of section 3.2.1.3.2, without system data or functional degradation within specification limits due to dielectric degradation, failure, or malfunction.

3.2.1.2.3 Electrical Connections - Connectors into the equipment from power source and input signals shall be located as shown and shall be of the type specified on BAC Drawing 10-20402.

3.2.1.2.4 Internal Wiring - Internal wiring shall consist of printed circuits to the maximum possible extent and shall be securely fastened to the mounting structure. Any electrical wire used shall be in accordance with an appropriate military specification and shall be insulated with cold flow resistant dielectric.

3.2.1.2.5 Electronic Parts List - The Vendor must submit to BAC for approval a complete list of the type and manufacturer of all electronic parts. BAC Document D2-9129 is applicable.

3.2.1.2.6 Grounding - Single point grounding external to the equipment package is to be employed for all circuits. Circuits within the equipment package shall be isolated from equipment case and base as follows:

A minimum isolation of one megohm at dc between case ground and any connector pin (except shield pins) or internal circuitry shall be provided.

Case grounding is required and separate signal and power ground leads shall be provided. Case grounding shall be brought out through a pin in each connector. The Multiplexer System Grounding method is shown in Figure 20.

3.2.1.2.7 Bonding - The provisions of GM07-59-3617A, paragraphs 3.2.3 and 3.2.4 apply. A direct metal to metal contact with the two surfaces held together by positive pressure is preferred.

3.2.1.3 Environmental Conditions

3.2.1.3.1 Non-Operative Conditions - While out of shipping container, the equipment shall be capable of satisfying the performance requirements of section 3.2.2.2 after being subjected to the following environmental conditions.

3.2.1.3.1.1 Temperature-Altitude- An ambient pressure-altitude range of sea level to 20,000 feet as encountered during air transport and air temperature ranging from a minimum of -45°F. (-43°C) to a maximum of plus 160°F (71°C), under unsheltered ground conditions. (This figure is based on a free air temperature of 125°F increased by 35°F solar radiative heating of a packing case or enclosure.) The air temperature may change at rates up to 1.8°F (1.0°C) per second.

3.2.1.3.1.2	Vibration - Complex vibration (including sinusoids and random noise) of which the combined maximum is represented by the sinusoidal vibration envelope of Figure 3.	G
3.2.1.3.1.3	Humidity - Relative humidity to 100% with conditions such that condensation takes place in the form of water or frost.	G
3.2.1.3.1.4	Shock - Shocks involved in free drops of up to 1 inch and pivot drops up to 4 inches. Corresponding acceleration peaks may be 100g.	G
3.2.1.3.1.5	Sand and Dust - Exposure to sand and dust as encountered in desert areas.	G
3.2.1.3.1.5.1	With the Technical Progress Reports required by D2-[illegible], the vender shall submit a report concerning the packaging of equipment to withstand this environmental conditions. Packaging shall be subject to BAC approval.	H
3.2.1.3.1.6	Salt Spray - Exposure to salt sea atmosphere as encountered in sea coast areas. Paragraph 3.2.1.3.1.5.1 is applicable.	G
3.2.1.3.1.7	Fungus - Fungus growth as encountered in tropical climates. Paragraph 3.2.1.1.1.2 and 3.2.1.3.1.5.1 are applicable.	G
3.2.1.3.2	Operative Conditions - The equipment shall be capable of satisfying the performance requirements of section 3.2.2.2 while being subjected to the following environmental conditions:	G
3.2.1.3.2.1	Temperature-Altitude - An ambient pressure-altitude change from sea level to 200,000 feet altitude within 1.5 minutes followed by a constand pressure-altitude of 200,000 feet for 2.5 minutes. Within one minute after missile launch, the equipment will be subjected to 600°F thermal radiation from external compartment walls. The duration of the 600°F thermal radiation will be about 3 minutes. There will be provisions for ground cooling to an ambient compartment temperature of +65°F during the pre-launch period.	G
3.2.1.3.2.2	Vibration - Complex vibration including sinusoids as represented by the vibration envelope of Figure 4 and random noise as represented by the vibration envelope of Figure 5.	G
3.2.1.3.2.3	Humidity - Relative humidity to 100%.	G

3.2.1.3.2.4 **Shock** - Shocks caused by missile engine ignition and cutoff. Excitation of equipment due to shock is considered covered in paragraph 3.2.1.3.2.2. G

3.2.1.3.2.5 **Acceleration** - Sustained acceleration of 15g maximum in each of 3 mutually perpendicular axes. G

3.2.1.3.2.6 **Acoustical Field** - Sound pressure levels of 140 db RMS (RE 0.0002 d/cm^2) overall (37 1/2 - 4800 cps) Randdm. G

3.2.1.3.2.7 **Angular Oscillation** - Maximum and rms excursions as follows about each of three mutually perpendicular axes. G

Frequency Range	Maximum Excursion	RMS Excursion
0.5 to 1 cps	1 degree	0.30 degree
1 to 3 cps	0.5 degree	0.15 degree
3 to 12 cps	0.1 degree	0.03 degree
above 12 cps	Determined by local mounting conditions.	

3.2.1.4 **Reliability**

Reliability shall be considered as a design factor on an equal basis with other design criteria such as performance, weight, and cost. The reliability of the article shall be such that when integrated into the system of which it is a part, it will perform its design function throughout its required life.

3.2.1.4.1 Reliability Requirement - The reliability of each Multiplexer system is defined as the probability of successful operation for 30 minutes of ground environmental conditions followed immediately by successful operation for 4 minutes while being subjected to flight environmental conditions.

A Multiplexer System is defined as consisting of the following complete and operational units:

(a) One Multiplexer Programmer and associated logic cards
(b) One Multiplexer and associated logic cards
(c) Two Control Boxes and associated logic cards
(d) Six Auxiliary Boxes and associated logic cards

A reliability of .994 shall be required for each Multiplexer System.

3.2.1.5 **Identification of Product**

The information specified shall be permanently marked on the article, using materials and/or processes that will insure legibility during the expected life of the article and the pre-production tests of section 4.0. Identification marking of the article shall conform to MIL-STD-130A, except that spaces for marking [illegible] registration number, date of manufacture, contracter order number, and weight may be left blank. The vendor's part number shall completely identify the article in the last 12 or less digits. G H

3.2.1.5.1 Boeing Part Number - The Boeing specification control part number shall not be permanently marked on the article nor shall it be contained in any part of the vendors part number. G

To facilitate BAC handling a separate and easily removable tag or adhesive label bearing the BAC part number shown. on the specification control drawing shall be affixed to the article. A tag shall not be attached through a mounting hole.

3.2.1.5.2 Serial Numbering - Articles manufactured in accordance with this specification shall bear serial numbers assigned by the vendor. The serial numbering system is the option of the vendor. G

3.2.1.5.3 Part Number Changes - Articles which completely satisfy the requirements of this specification shall be assigned a specific vendor part number. Articles which do not completely satisfy the requirements of this specification shall be differentiated from those that do, by a different vendor part number. In addition, different Boeing dash numbers may be assignedto distinguish parts not completely satisfying the requirements of this specification. After final approval of the article by BAC, the part number assigned by the vendor shall be positive identification such that the article and/or components may be procured by vendor part number alone without reference to this specification. Changes in the article, and/or components whether initiated by BAC or the vendor, which affect functional, physical, or structural interchangeability shall always be attended by a change in vendor's part number to identify the new configuration. The drawing number requirements of Specification MIL-D-5028B shall govern changes in the manufacturer's part numbers. G

3.2.1.5.4 Supplementary Identification - A "Unit Code" or "Card Code", as applicable, shall be affixed to the article to supplement the part number when its electrical and mechanical configuration have been verified to be in accordance with the requirements of a specific test program as defined in the applicable Program Control Drawing. A "PCM/FM Airborne Telemetry Program Control Drawing. Test Program XX" will be prepared by Boeing to define the specific complement of logic cards and the matrix programming of each system purchased under this specification. The Program Control Drawing effectivity for all systems is tabulated in Boeing drawing 21-50000. "PCM/FM Airborne Telemetry Program Control Drawing."

3.2.1.5.4.1 Unit Code - A "Unit Code" will be stamped on a metal cal and affixed to the space provided on the nameplate of the Multiplexer Programmer, Multiplexer, Control Boxes, and Auxiliary Boxes when their logic card complements have been verified to be in accordance with the requirements of the applicable Program Control Drawing.

3.2.1.5.4.2 Card Code - A "Card Code" will be stamped on the connector shell of the 16 Channel Matrix Cards when the installation of diodes and jumper wires has been verified to be in accordance with the programming requirements of the applicable Program Control Drawing.

3.2.2 Detailed Requirements

3.2.2.1 Multiplexer Programmer Design Requirements

In addition to providing regulated power to the multiplexer units, the Multiplexer Programmer shall direct the operation of the multiplexer units by means of secondary command pulses and reset pulses. These secondary command and reset pulses shall be triggered by primary command and reset pulses which will be supplied by the Function Programmer (not part of this specification). A command pulse shall serve to enact the "sample" gate of a multiplexer unit. A reset pulse shall serve to re-orient command logic should a discrepancy exist. The distribution and sequence of the command and reset pulses to the multiplexer units shall be according to the program logic as described in paragraph 3.2.2.1.1. For time relationships and representative waveforms of the

3.2.2.1 (Cont'd) Multiplexer Programmer signal requirements described in this section, refer to Figure 12.

3.2.2.1.1 Program Logic - The Multiplexer Programmer shall be capable of initiating command pulses to the multiplexer units at a rate consistent with the primary command pulse rate. Primary command pulses will be received by the Multiplexer Programmer via two channels at 12,800 pulses per second per channel. The distribution of command pulses to the multiplexer shall be such as to permit proper multiplexer operation at a reduced system channel capacity in the event that one of the input primary command pulse channels ceases to operate. For the sake of clarity, the two primary command pulse channels into the Multiplexer Programmer are referred herein as command "A" and command "B". Consistent with the capacities of the multiplexers, the Multiplexer Programmer shall utilize the 12,800 pulses per second, command "A" to trigger a serial train command pulse to the 128 channel portion of the Area "C" multiplexer unit. The 12,800 pulses per second of command "B" shall be capable of being distributed as follows, depending on the program:

(a) 6400 pulses per second to both the Area "A" and the Area "B" Multiplexer Systems.
(b) 6400 pulses per second to either the Area "A" or the Area "B" Multiplexer System, 3200 pulses per second to the remaining Area "A" or "B" Multiplexer System, and 3200 samples per second to the 32 channel portion of the Area "C" Multiplexer. (See Figure 21 for area designations).

3.2.2.1.1.1 One bit time is defined to be 1/345600 seconds, which is approximately 2.9 microseconds. The time interval between pulses in a channel is constant at 27 bit times, however the pulse train of command "A" channels leads the pulse time of command "B" by 16 bit times except at the last word of the analog frame the "A" command pulse occurs one bit time later.

3.2.2.1.1.2 Every thirty milliseconds, the Multiplexer Programmer will receive a primary reset pulse, which shall be utilized to trigger reset pulses to each of the multiplexers simultaneously. This primary reset pulse marks the time allotted to complete one cycle of data sampling.

3.2.2.1.2 Primary Command Signals

3.2.2.1.2.1 Pulse Amplitude - The pulse amplitude will be 10 ± 2 volts. The positive level shall indicate the absence of a pulse and shall be at ground reference ± 1 volt. The negative level shall indicate the presence of a pulse.

3.2.2.1.2.2 Pulse Characteristics - The rise time (from 10% to 90% amplitude) will not exceed 0.5 microseconds when driving a load of 10,000 ohms in parallel with 200 picofarads capacitance. The pulse duration will be not less than one bit time nor more than three bit times. The fall time (to 10% amplitude) shall not exceed 5 microseconds when driving a load with 200 picofarads capacitance.

3.2.2.1.3 Primary Reset Pulses

3.2.2.1.3.1 The pulse amplitude provisions and pulse characteristics requirements of paragraphs 3.2.2.1.2.1 and 3.2.2.1.2.2 are applicable.

3.2.2.1.3.2 Time of Occurrence - The onset of the reset pulse will occur at the onset of the last bit time of the last word of the analog frame - see Figure 12.

3.2.2.1.4 Multiplexer Programmer Output/Coder Input - This signal represents the results of combined multiplexer operation under the direction of the Multiplexer Programmer. The signal consists of a series of analog data voltage samples.

3.2.2.1.4.1 Analog Sample Rate - The Multiplexer Programmer shall trigger the multiplexers so as to provide a maximum of 25,600 data samples per second to the coder which is an analog-to-digital converter, (not part of this specification).

3.2.2.1.4.2 **Analog Sample Amplitude** - The amplitude range of the data sample shall be 0 to +5 volts.

3.2.2.1.4.3 **Analog Sample Duration** - In accord with the "on" time of the multiplexer unit, the duration of each analog sample (as presented to the coder) shall be a minimum of 25 microseconds free of all switching transients lags, noise or other derogative factors of the Multiplexer and Multiplexer Programmer which degrade the data beyond the accuracy requirements of this specification. (Coder sampling is initiated 5.8 microseconds after the onset of a command pulse. This will present a stable sample to the coder 0.8 microseconds prior to coder interrogation, see paragraph 3.2.2.2.2). The maximum "on time" of an individual sample shall be such that the sample is not coincident with, nor shall it cause any latent derogative influence on a subsequent data sample. G

3.2.2.1.4.4 **Impedance** - The output impedance of the Multiplexer Programmer shall be less than one ohm. G

3.2.2.1.4.5 **Output Current Capability** - The Multiplexer Programmer shall be capable of providing 1.0 milliamps to the coder for a full scale data signal (5 volts) output. The output voltage shall be independent of the output impedance, within the data accuracy requirements of this specification, up to a maximum load of 1.0 milliamperes. G

3.2.2.1.5 **Cooling** - The equipment may be operated for as long as 36 consecutive hours on the bench at an ambient temperature of 80°F with external cooling such as a cold plate or blower if necessary. During the pre-launch period, ground cooling facilities will be available to maintain the equipment ambient temperature at approximately 65°F. These ground cooling facilities will supply 25 pounds of air per minute at about 45°F to the instrumentation section and will be available until 10 seconds before launch. Cooling air will not be ducted into any of the components. During flight, there shall be no external cooling system for the equipment. The unit shall therefore be designed and protected as necessary to perform within the limits specified while being subjected to the temperature-altitude environmental conditions as described in paragraph 3.2.1.3.2.1. G

3.2.2.1.6 **Power Source** - The multiplexer equipment shall operate from 28 + 2 Volt D-C power system containing maximum electrical interference components as set forth in the test requirements of paragraph 4.5.2.7. Paragraph 3.2.1.2.1 is applicable. The power system negative lead will be grounded to the missile ground point (external to the multiplexer system). The Multiplexer Programmer shall provide secondary power supplies and converters for the Multiplexer Programmer and the Area "C" Multiplexer. The secondary power supplies shall be designed to withstand output shorts without damage to the converters and without primary current drain beyond the maximum limits of this specification. Fuses or circuit breakers shall not be utilized in the design. Power regulation for the Multiplexer Programmer shall be provided within the Multiplexer Programmer. Power regulation for the Area "C" Multiplexer shall be provided within the Multiplexer Programmer or the Multiplexer as dictated by equipment design requirements. Maximum primary power current drain shall not exceed 2.0 amperes. Approximate primary power impedance characteristics are given in 3.2.2.1.6.1 and 3.2.2.1.6.2. (See Figure 21 for area designations). G J

3.2.2.1.6.1 Ground Power - Ground operation power will be supplied by a T.R. unit operating from 60 cycle line power. The T.R. unit output will be 28 V DC + 2 volts with maximum ripple limited to + 1% (peak to peak). Voltage regulation is 28 + 0.6 V for loads to 15 Amp. and frequency variation to 5 Kc. The approximate impedance of the ground power supply is as follows: C

0.5 ohms or less, DC
0.2 ohms from 2 cycles to 10 Kc
0.2 ohms to 1.0 ohm linearly from 10 Kc to 100 Kc

3.2.2.1.6.2 Airborne Power - The airborne PCM/FM primary power supply is a battery containing approximately 20 cells of 3 ampere-hour capacity. The load imposed on this power supply is approximately 14 amperes. The internal impedance of the battery varies with both time and load. The calculated nominal initial internal impedance of the battery with a 14 ampere load is 0.75 ohms decreasing to 0.65 ohms between 2 and 3 minutes operation. Allowances for cell vibration, 30 day stand time, and temperature variation will cause a maximum and minimum initial impedance values of 0.9 ohms. and 0.65 ohms. C

3.2.2.1.7 Feed-back Ripple - The Multiplexer Programmer unit shall contain adequate filtering at its input terminals to eliminate any feedback ripple greater than 1.00% of the primary voltage to the primary power source. The current feedback ripple shall not exceed 1.00% peak of average load current drain throughout the ripple frequency domain.

3.2.2.1.8 Transient Potentials - The design of the equipment shall be such as to withstand without catastrophic failure voltage transients in the power system of 28 ± 12 volts for a maximum duration of 25 milliseconds with a repetition rate not greater than once per second. The equipment must continue to operate within specification accuracies and tolerances after being subjected to voltage transients described. G H

3.2.2.1.9 Adjustments - The equipment shall operate within the tolerances specified herein during the entire operational life of the equipment while being subjected to the environmental conditions specified without adjustment or tuning. See Drawing 10-20402. G K

3.2.2.2 Multiplexer Programmer Performance Requirements

With power supplied from the R&D primary power supply in accordance with paragraph 3.2.2.1.6 and input signals in accordance with sections 3.2.2.1.2 and 3.2.2.1.3, the Multiplexer Programmer shall satisfy the following performance requirements.

3.2.2.2.1 Life - The equipment total operating life shall be 500 hours. (Mainly, this life will be accumulated on the bench in normal ambient environment and as installed in the missile in the launching revetment. The equipment will operate at all times during the missile's flight and will be used to obtain data from a time several minutes prior to first missile motion until flight termination.) C

3.2.2.2.2 Timing and Accuracy - The performance of the Multiplexer Programmer in conjunction with the multiplexers shall provide a serial data pulse train to the coder with timing and accuracies as set forth in 3.2.2.2.2.1 and 3.2.2.2.2.2. G

3.2.2.2.2.1 Timing - The Multiplexer Programmer shall present properly sequenced data samples to the coder at the accuracy requirements of this specification within 5 microseconds after the onset of the respective command pulses for the given data samples. C

3.2.2.2.2.2 Accuracy - The Multiplexer Programmer shall present to the coder data samples which have not been degraded in accuracy by Multiplexer and Multiplexer-Programmer functions or signal conditioning, for a data source impedance range of 10 ohms to 1,000 ohms, by more than those amounts set forth below:

± 0.5% of full scale high-level (0 to 5 volts full scale) channels.

± 0.6% of full scale for a medium level (0 to 50 millivolts full scale) channels.

± 2.0% of full scale for low-level (0 to 10 millivolt full scale) channels.

The above stated accuracies include the error effects of current feedback as set forth in paragraph 3.3.2.2.6 for a grounded center-tapped 1K source. The data source impedance shall be 1000 ohms or that impedance for which maximum error is incurred for the impedance range of 10 through 1000 ohms.

The error contribution of common mode rejection (common mode potential signals) are excluded from accuracy limits stated above. See Drawing 10-20402. K

3.2.2.2.3 Unit Interdependence - In the event of the loss of one or two of the multiplexer units due to either a short or open circuit, the Multiplexer Programmer shall continue to operate the remaining multiplexer units in accordance with the design and performance requirements specified herein.

3.2.2.2.4 Fault Isolation - The output circuitry of the Multiplexer-Programmer shall be designed to limit the output signal potential to the coder within the values of plus 7.0 volts to minus 2.5 volts as a result of Multiplexer System malfunction or Multiplexer data input signal fault. The immediate output circuitry of the Multiplexer Programmer shall be so designed both mechanically and electrically as to minimize the possibility of component failure which would permit a fault signal in excess of the stated values) to occur in the output to the coder.

3.2.2.3 Deleted K

3.3 DESIGN REQUIREMENTS FOR MULTIPLEXER AND LOGIC CARDS

The requirements set forth herein describe a Multiplexer unit (10-20402-42) for an airborne PCM/FM telemetry system. A Multiplexer unit as referred to in the following paragraphs shall consist of a Multiplexer case and Logic Cards. Specific dash numbers are assigned to the Logic Cards in Section 3.8.

3.3.1 General Requirements

3.3.1.1 Physical Requirements

All of the general physical requirements specified in section 3.2.1.1 are applicable.

3.3.1.2 Electrical Requirements

All of the electrical requirements specified in section 3.2.1.2 are applicable.

3.3.1.3 Environmental Conditions

The Multiplexer unit shall be capable of satisfying the performance requirements of section 3.3.2.2 while being subjected to the operative conditions of section 3.2.1.3.2 and after having been subjected to the non-operative conditions of section 3.2.1.3.1.

3.3.1.4 Reliability

The reliability requirements of section 3.2.1.4 are applicable.

3.3.1.5 Identification of Product

The provisions of section 3.2.1.5 are applicable.

3.3.2 Detailed Requirements

3.3.2.1 Multiplexer Design Requirements

3.3.2.1.1 Flexibility - Through use of program instruction cards, the design of the multiplexer unit shall be completely flexible within the unit capacity limits specified in paragraph 3.3.2.1.2 with respect to sequence of data sampling, the number of data sources to be sampled, and the input voltage levels of the data sources. A program change shall be accomplished only through substitution of program instruction cards with simple tools and procedure. The design shall provide for an absolute minimum of re-wiring, and switches or relays shall not be used.

3.3.2.1.2 Unit Capacity - The design shall provide for flexibility as specified in paragraph 3.3.2.1.1 within the following command logic limits:

The capacity shall be 128 channels at 12,800 samples per second triggered from command "A" and 32 channels at 3200 samples per second triggered from command "B". K

The unit shall be capable of accommodating input signal ranges of 0 to plus 5 volts., 0 to plus 50 millivolts, and 0 to plus 10 millivolts. However, only two ranges shall be utilized at a time for the 128 channels and one range for the 32 channels. One of the two ranges for the 128 channel unit shall be 0 to plus 5 volts, except that channels 81 through 128 must be 0 to plus 5 volts only. In addition, assignment of channels for each voltage range shall be limited to multiples of four. K

3.3.2.1.3 Data Source Output/Multiplexer Input - For the purpose of determining equipment performance during the tests required in section 4.0 of this specification, the command logic to be used shall be per the applicable test condition logic arrange-

3.3.2.1.3 (Cont'd)

ment specified in the Boeing Program Control Drawing 21-50105. K

3.3.2.1.3.1 Common ground input circuitry shall not be employed. Those circuits not isolated in any other way shall employ dual switching for isolation of return or ground lead circuits.

3.3.2.1.3.2 The nominal input impedance shall be at least 50,000 ohms ± 10% when the multiplexer is "on". A nominal input impedance greater than 50,000 ohms shall be considered as a design objective. The tolerance limits of any nominal input impedance attained higher than 50,000 ohms shall be stable within ± 10% of the attained nominal input impedance. The input impedance shall be greater than one megohm when the multiplexer is off.

3.3.2.1.4 Command Signals - A command pulse from the Multiplexer Programmer shall alter the state of the multiplexer "read" gate, to permit sampling of a data source.

3.3.2.1.5 Reset Pulses - A reset pulse shall serve to re-orient command logic, should a discrepancy occur.

3.3.2.1.6 Multiplexer Output/Multiplexer Programmer Input - The data output signal from the Multiplexer unit shall be in the form of a serial pulse train, consistent with the serial pulse train of the triggering command pulses. The analog data from the Multiplexers shall be timed by the Multiplexer Programmer so as to produce a single time-shared analog signal at the Multiplexer Programmer output.

3.3.2.1.6.1 Sampling Rate - The Multiplexer unit shall be capable of a combined maximum sampling rate of 16,000 per second. The unit design shall provide for sampling rate flexibility to permit sampling of any one channel or group of channels triggerred from command channel "A" at the following sampling rates: 800;400;200;100; 33 1/3 (samples/second). The remaining 3,200 samples per second shall be triggered from command channel "B" and have the following blexibility of sampling rates: 800; 400; 200; 100; 33 1/3 (samples/second). K

3.3.2.1.6.2 "On" Time - Paragraph 3.2.2.1.4.3 is applicable.

3.3.2.1.6.3 **Analog Sample Amplitude** - The amplitude range of the data sample shall be 0 to +5 volts.

3.3.2.1.7 Cooling - Paragraph 3.2.2.1.5 is applicable.

3.3.2.1.8 Adjustment - The adjustment provisions of paragraph 3.2.2.1.9 are applicable.

3.3.2.1.9 Fault Isolation - The design of the Multiplexer unit shall be such that any failure of one or more multiplexer input measurement due to fault conditions shall not cause subsequent failure of other channels, nor shall it in any way degrade the data of other channels. K

3.3.2.2 Multiplexer Performance Requirements

With reset pulses, command pulses and power supplied by the Multiplexer Programmer, and applicable input data signals, the Multiplexer unit shall satisfy the following performance requirements: G

3.3.2.2.1 Life - Paragraph 3.2.2.2.1 is applicable.

3.3.2.2.2 Pulse Degradation - The composite effects of transistor switch pedestal, cross talk, noise, differential current feedback, thermal drift, and all other data signal degradation factors of the Multiplexer and the Multiplexer Programmer shall not reduce data accuracy beyond the limits set forth in paragraph 3.2.2.2.2.2. The same impedance range of paragraph 3.2.2.2.2.2 is applicable for these accuracy requirements. G

3.3.2.2.3 D.C. Drift - Delete G

3.3.2.2.4 Switching Time - Delete G

3.3.2.2.5 Amplification Linearity - Delete G

3.3.2.2.6 Feedback Current - The design of the Multiplexer equipment shall be such that a minimum feedback current to the data source will occur. During manual operation the allowable feedback current (I_f) to a data source from 0 to 10 millivolt or 0 to 50 millivolt channels is as follows: (Refer to Figure 23). G

Condition "A"	I_{f1}max. = 300 nanoamperes	J
Condition "B"	I_{f2}max. = 300 nanoamperes	
Condition "C"	I_{f3}max. = 300 nanoamperes	
Condition "D"	I_{f4}max. = 300 nanoamperes	

The maximum current feedback for a 0 to 5 volt channel to a data source for conditions "A" through "D" (Figure 23) shall be limited to an output error of one millivolt. The data source impedance range for all channel levels is 10 ohms through 1000 ohms J

Any combination of data source configurations shown in Figure 23 for any combination of data signal level channels (within the multiplexer equipment channel capacity capability) may be required for PCM multiplexer equipment instrumentation application. The multiplexer design shall accommodate the above application flexibility and maintain the current feedback limitations set forth above.

3.3.2.2.7 Malfunction

3.3.2.2.7.1 Multiplexer Unit - Should a fault condition occur in either a low or high level channel, no greater than a 10 volt fault potential shall be introduced to the data source through a 50,000 ohms (or more) source impedance.

3.3.2.2.7.2 Data Sources - 0 to +10 millivolt and 0 to +50 millivolt channels shall be capable of withstanding a data source fault potential of 12 volts without causing the loss of other channels. High level channels shall be capable of withstanding a data source fault potential of 28 volts without causing the loss of other channels. C

3.3.2.2.8 Common Mode Rejection

The Multiplexer unit shall be capable of rejecting DC common mode potentials over the range of minus 10 to plus 10 volts with a common mode rejection ratio of 5000:1 on 5 volt channels and 20000:1 on 10 and 50 millivolt channels. J

The Multiplexer unit shall be capable of rejecting AC common mode potentials of 200 millivolts. The 5 volt channel AC common mode rejection ratio is ,000:1 at DC decreasing linearly with increasing frequency to 2,000:1 at 10 kilocycles. The 10 and 50 millivolt channel AC common mode rejection ratio is 20,000:1 at DC decreasing linearly with increasing frequency to 2,000:1 at 10 kilocycles.

K

3.4 Deleted

3.5 DESIGN REQUIREMENTS - SIMULATION AND TEST EQUIPMENT

The requirements set forth herein describe the special Simulation and Test Equipment required to check out certain features of the airborne PCM/FM telemetry Multiplexer Equipment. The 10-20402-44 equipment design provides, by the use of appropriate test cable assemblies, test facilities for all multiplexer equipment of this specification document.

3.5.1 General Requirements

3.5.1.1 Physical Requirements

All of the general physical requirements specified in section 3.2.1.1 are applicable with the exception of paragraphs 3.2.1.1.4, 3.2.1.1.5, 3.2.1.1.7, 3.2.1.1.8, 3.2.1.1.9, 3.2.1.1.10, and 3.2.1.1.11.

3.5.1.1.1 Maintainability - Maintainability shall be considered as a design factor along with other major design parameters. The design shall provide for simple installation or removal of the equipment from a mounting rack without damage to interconnecting wiring and connectors and with a minimum of special tools or equipment. Installation and removal of cards shall be accomplished with a minimum of special tools. When special tools are required for installation or removal of cards, these tools shall be provided with and as a part of the equipment. Special test cards to extend logic cards outside the rack or panel for maintenance and test purposes shall be provided with the equipment. The design must provide for rapid servicing and fault detection.

3.5.1.1.2 Construction - Modular design shall be employed to the greatest practical extent to facilitate maintenance, repair and servicing. Whenever possible, plug-in assemblies shall be used.

3.5.1.1.3 Components - The use of solid state components are desirable particularly in the simulation portion of the unit. However, in the test checkout portion of the unit, high grade commercial tubes may be used provided they are interchangeable with tube according to MIL-E-4682. All requirements shall be met

3.5.1.1.3 (Cont'd) without tube selection except that not over 10% of the tube circuits may contain trimming adjustments for recalibration of circuits after tube change. All electronic sub-assemblies shall be designed to eliminate the necessity of adjustment after replacement by a similar type of sub-assembly.

3.5.1.1.4 Test Points - Electrical test points shall be provided for the purpose of performing maintenance and trouble-shooting. Test points shall include, but are not limited to, signal input and output potential and waveform for each plug-in module and output potentials of each power supply. These test points shall be readily accessible by removing a panel or opening a door.

3.5.1.1.5 Physical Size and Weight - The Simulation and Test Equipment shall be rack mounted in cabinets. A table shall be attached to the cabinets to serve as a work bench. Space shall be provided for a digital print-out type of recorder and its associated wiring. Cabinet, panel and table dimensions shall be as specified per BAC Specification Control Drawing 10-20402. As a design objective, each package for mounting in the cabinet shall not weigh more than 30 pounds. Should the design objective not be met for a package, specific design approval must be obtained from BAC for excess weight variance. Any package which exceeds the 30 pound design objective limitation must have a warning placard attached to the cover of the package as follows:

WARNING

HANDLE WITH CARE

EXCESSIVE WEIGHT

____LBS:

3.5.1.1.6 Workmanship - Paragraph 3.2.1.1.5 is applicable except that BAC Document D2-7687 is not applicable. C

3.5.1.1.7 Finish - Protective finishes shall be in accord with BAC Document D2-4051. The color of the control panels shall be gray, color number 26492, and the color of the equipment racks shall be green, color number 24300 of Federal STD 595. Type TT-E-529 semi-gloss shall be the applicable paint specification. C

3.5.1.1.7.1 Dissimilar Metals - The grouping and usage of dissimilar metals shall be in accord with MIL-F-14072. C

3.5.1.1.8 Safety - The design shall be such as to provide maximum safety in accordance with the requirements of Section 3.2.11 of MIL-E-4158B to personnel installing operating and maintaining the equipment. G

3.5.1.1.8.1 Power Terminals - Power terminals or busses with potentials in excess of 30 volts shall be covered to preclude personnel shock hazards during maintenance operations. G K

3.5.1.2 Electrical Requirements

The electrical requirements specified in paragraphs 3.2.1.2.4 and 3.2.1.2.7 are applicable. G H

3.5.1.2.1 Electrical Interference Suppression - The equipment shall meet the requirements of STL Document GM07-59-2617A. The equipment is defined as Class III per GM07-59-2617A. See Drawing 10-20402. H K

RF filters shall be included in the equipment to prevent spurious electrical interference from being conducted into the equipment from the multiplexers and to prevent spurious radiated interference from degrading the performance of the equipment. Interference attenuation is required on the electro-mechanical printer in addition to all other required system interference suppression measures. G K

3.5.1.2.2 Electrical Connectors - Plugs and sockets shall be selected to assure reliable contact after repeated insertion and removal. In no case shall electrical connections depend upon wires, lugs, terminals and the like being clamped between any metallic member in an insulation material of other than ceramic or vitric nature. AMP Taper Block Assemblies are excepted from this requirement. It shall not be necessary to remove or disconnect equipment to gain access to input and output connections. G

The connectors used for the digital signals to the multiplexer-programmer (reference paragraph 3.5.2.1.2.1) shall be separate from the connectors used for the analog signals to the multiplexers (reference paragraph 3.5.2.1.2.2) G K

3.5.1.2.3 Deleted A

3.5.1.2.4 Grounding - The chassis shall be returned to utility ground through a pin in the chassis-to-rack connector. Bonding of the chassis to the frame will be provided by mating the rear surface of the panel to the rack frame, and through the panel-to-frame fasteners. A

3.5.1.2.5 Enclosures - All switch panels, attenuators, attenuator selector switches, impedance switches and the like shall be enclosed in a metal shield to prevent accumulation of foreign matter, such as dust, in switch contact areas and as an aid in minimising radiated and susceptability to electrical interference.

3.5.1.3 Environmental Conditions

The equipment shall be capable of satisfying the performance requirements of Section 3.5.2. While being subjected to the following operative conditions and after having been subjected to the non-operative conditions on Section 3.2.1.3.1 with the following exceptions:

(a) The requirements of Section 3.2.1.3.1 do not apply to the digital printer.
(b) The requirements of paragraphs 3.2.1.3.1.2 and 3.2.1.3.1.4 do not apply to the A-to-D converter.

3.5.1.3.1 Operative Conditions

3.5.1.3.1.1 Temperature-Altitude - An ambient pressure-altitude of approximately sea level together with surrounding air temperature ranging from a minimum of 40°F to a maximum of 100°F.

3.5.1.3.1.2 Deleted

3.5.1.3.1.3 Humidity - Relative humidity to 100%

3.5.1.3.1.4 Deleted

3.5.1.4 Identification of Product

The requirements of Section 3.2.1.5 are applicable with the exception of those of sub-section 3.2.1.5.4

3.5.1.5 Human Factors

Every effort shall be made to comply with the design practices contained in this section. However, where adherence to these practices result in degradation of over-all system performance, the performance considerations shall govern.

3.5.1.5.1 Controls and Displays - Each control and display shall be identified as to function. Labels shall be so located as to preclude association of a label with the wrong control or display. Labels shall be brief. Although the nomenclature should clearly indicate the function being displayed or controlled, highly similar names shall be avoided. Abbreviations, where required, shall be common or meaningful and shall conform with MIL-STD-12A.

3.5.1.5.1.1 **Lettering** - Lettering on the panel shall be black, color #37038 of Fedral STD 595. Capital letters shall be used in preference to lower case letters. Letters shall be preferably etched or embossed into the panel, however, the following two lettering processes are acceptable. A

(a) Scotchcals, Minnesota Mining and Manufacturing Company #3650, manufactured per Boeing Material Process Specification BMS 10-26.

(b) Silk Screening per Boeing Material Process Specification BAC 5306 or equivalent.

3.5.1.5.1.2 Indicator Lights - The colors specified below shall be in accord with MIL-C-25050 and color coding shall be as follows:

Red - Shall indicate that an inoperative or dangerous condition exists.

Amber - Shall indicate that a marginal condition exists.

Green - Shall indicate that a satisfactory condition exists.

White - Shall indicate those conditions that are not intended to provide a right or wrong condition. Sample applications are (a) to indicate alternative functions, (b) to indicate transistory conditions.

The above code is excepted for the case of commercial units which employ neon lamps to indicate an operative condition. For this case, red may be used to indicate an operative condition. G

3.5.1.5.1.3 Deleted H

3.5.1.5.1.4 **Elapsed Time Meter - The test and simulation equipment shall include a standard elapsed time meter in the 10-20402-44 DC power circuitry to record accumulated operating time of the 10-20402-41 thru -48 multiplexer equipment.** L

3.5.2 **Detailed Requirements**

3.5.2.1 Simulation and Test Equipment Design and Performance Requirement

The Simulation and Test Equipment shall be capable of furnishing the Multiplexer Programmer, Multiplexer and Multiplexer Systems (in any multiplexer equipment design configuration capability, see paragraphs 1.1.2, 1.1.3, and 1.4) with all input stimuli necessary to check the combined performance of the multiplexer complex. The Simulation and Test Equipment shall also be capable of monitoring the resultant output of the Multiplexer Programmer, Multiplexer units so as to determine that the combined operation of this equipment is within the limits specified.

3.5.2.1.1 Power Requirements - The Simulation and Test Equipment shall be designed to operate from a 115V rms (±5%), single phase, 60 cps ± 1 cycle power source.

3.5.2.1.2 Simulation Equipment Requirements - The Simulation and Test Equipment shall be capable of providing the following inputs to the Multiplexer equipment being tested.

3.5.2.1.2.1 Multiplexer Programmer Inputs

3.5.2.1.2.1.1 Primary Command Pulses - Primary command pulses shall be as specified in Section 3.2.2.1.2, shall occur at the proper intervals defined by Section 3.2.2.1.1 and shall be available via two channels as described by 3.2.2.1.1. In addition, the pulse duration shall be variable from one to three bit times. Refer to figure 12 for time relationships with representative waveforms.

The condition of the "A" Command Pulse at the last word of the analog frame as stated in paragraph 3.2.2.1.1.1 and the condition that the positive level shall be at ground reference ± 1 volt as stated in paragraph 3.2.2.1.2.1 is excepted as a requirement of this specification.

3.5.2.1.2.1.2 Primary Reset Pulses - Primary reset pulses shall be as specified in Sections 3.2.2.1 and 3.2.2.1.3. Refer to Figure 12 for time relationships with representative waveforms.

The reset pulses described here and the command "A" and command "B" pulses described in paragraph 3.5.2.1.2.1.1 shall be derived from a crystal controlled bit rate oscillator operating at a frequency of 345,600 ± 1% bits per second. The condition that the positive level shall be at ground reference ± 1 volt as stated in paragraph 3.2.2.1.2.1 is excepted as a requirement of this specification.

3.5.2.1.2.1.3 Power - Power shall be as specified in paragraph 3.2.2.1.6. In addition, there shall be provisions for varying the voltage input within the limits defined in paragraph 3.2.2.1.6.

3.5.2.1.2.2 Multiplexer Inputs

3.5.2.1.2.2.1 Power Inputs - Power as described in 3.5.2.1.2.1.3 shall be provided to the two Multiplexer Systems.

3.5.2.1.2.2.2 Internal D-C Signal Source - The Simulation and Test Equipment shall contain a regulated D-C power supply or supplies of sufficient capacity to serve as a simultaneous input signal source for all 352 input channels of a complete Multiplexer System.

Switches and precision attenuators shall be provided such that each channel can be supplied with an input signal of any of three levels (0 to 5V, 0 to 50 mv and 0 to 10 mv). The 10-20402-44 configuration shall provide the output signals set forth at both 10 ohm and 1000 ohm output impedances. Facilities (10-20402-44) to provide test configurations of figure 23 to the design requirements of paragraph 3.3.2.2.6 and in combinations stated therein shall be a part of the design of the 10-20402-44 Simulation and Test Equipment.

3.5.2.1.2.2.3 External Source - Provisions shall be made for introducing AC or DC signals into the channel inputs from an external source in place of the internal source.

3.5.2.1.2.2.4 Common Mode Signals - Provisions shall be made for introducing Common Mode Signals to the multiplexer channel inputs from an external source. The equipment shall have the facility of AC and DC (+ or -) Common Mode signals in place of the internal source.

3.5.2.1.3 Test Equipment and Requirements

3.5.2.1.3.1 Multiplexer Programmer Output to Coder - The test equipment shall be capable of checking the following characteristics of the Multiplexer Programmer output to the coder under dynamic conditions:

(a) Individual channel data degradation due to amplification non-linearity or drift and Multiplexer Equipment Feedback current.

3.5.2.1.3.1 (Cont'd)

(b) Individual channel data degradation due to interchannel modulation (cross talk).

(c) Individual channel degradation due to common mode input signals (AC or DC).

(d) Check Multiplexer equipment performance to within 0.1% for a 0 to 5 volt output and check performance at a reduced accuracy for a 0 to 6 volt input.

(e) Ability to reset and resynchronize properly from any state of count in the multiplexer countdown circuits.

(f) Data channel sequencing (verification of input channel assignments to analog word segments).

(g) Capability of operating properly with a simulated transducer impedance of 1000 ohms in parallel with 1500 Picofarads of capacitance. K

3.5.2.1.3.1.1 The tests listed in paragraph 3.5.2.1.3.1 shall be capable of being performed by three modes of operation. During these modes of operation, the analog data source voltage shall be sampled each time that the multiplexer analog word segment is sampled. The two quantities shall be digitized and compared for accuracy. The comparison function of the Simulation and Test Unit shall be capable of being programmed to compare the "source" and "sample" data to a preselected error tolerance limit. K

The 10-20402-44 units shall, as a minimum requirement, have all multiplexer error tolerance design limits of Section 3.2, 3.3, and 3.7 as available settings, tolerance settings which will accommodate feedback current measurements of Section 3.3.2.2.6 and a 3% tolerance limit setting if not already included.

The operational modes shall be as follows:

(a) Automatic Mode - The automatic mode shall sequentially sample one analog word segment during each succeeding analog frame. All channel "A" word segments shall be sampled in turn, then all channel "B" word segments after which the sequence shall halt. In the event that the analog word segment is beyond the selected tolerance, the sequence shall halt and the following quantities shall be displayed in decimal form until the sequence is automatically commanded to resume:

3.5.2.1.3.1.1 (Cont'd) (a) (Continued)

Analog word number and segment
Analog source code
Analog sample code

The automatic mode applies to paragraph 3.5.2.1.3.1 (a) and (e) only.

(b) Semi-Automatic Mode - The semi-automatic mode shall dwell on a selected analog word segment until a manually entered "advance" signal selects the next succeeding word segment. It shall be possible to take one sample of the analog source and the analog word segment for digitizing, comparison and display until a resample is commanded. The semi-automatic mode applies to paragraph 3.5.2.1.3.1 (a) thru (g).

(c) Manual Mode - There shall be a group of switches which shall allow any given analog word segment to be selected. This selected word segment, together with the analog source shall be digitized, compared and displayed until a resample is commanded. The manual mode applies to paragraph 3.5.2.1.3.1 (a) thru (g).

(d) The device used for digitizing the analog source and analog samples shall be capable of being used independdently as a piece of test equipment having the functions of a digital voltmeter.

3.5.2.1.3.1.2 The tests listed in paragraph 3.5.2.1.3.1 and the modes of operation listed in paragraph 3.5.2.1.3.1.1 shall be capable of being performed with the internal DC source described in paragraph 3.5.2.1.2.2.2 or the external source described in paragraph 3.5.2.1.2.2.3.

3.5.2.1.3.1.3 During any of the three modes of operation described in paragraph 3.5.2.1.3.1.1, it shall be possible to digitize and display only the analog source voltage or the analog sample voltage. It shall be possible to initiate this mode by means of a switch. The GO/NO GO decision circuitry shall be disabled when operating in this mode.

3.5.2.1.3.1.4 Printer - A printer shall be provided which shall be capable of recording the outputs obtained during the tests listed in paragraph 3.5.2.1.3.1. This requirement does not apply to paragraph 3.5.2.1.3.1.3.

3.5.2.1.3.1.4.1 Deleted

3.5.2.1.3.1.4.2 The printer shall be capable of operating in the following modes:

(a) Automatic Print Mode 1 - During the automatic sequence mode of operation of the basic unit, printout shall be made only for those word segments which are out of tolerance. K

(b) Automatic Print Mode 2 - During the automatic sequence mode of operation, all analog word segments shall be printed. K

(c) Manual Print Mode - During the semi-automatic or manual mode of operation, printout shall occur only on a manually entered print command. A "STANDBY-OPERATE" switch and a "PRINT COMMAND" switch on the printer will meet this requirement. K

3.5.2.1.3.1.4.3 **Finish** - The Hewlett-Packard printer supplied in the 10-20402-44 is exempt from the color requirements set forth in paragraph 3.5.1.1.7.

3.5.2.1.3.2 Test Points - The test equipment shall include, but shall not be limited to, test points to monitor the following signals with standard laboratory test equipment under dynamic conditions:

(a) Primary command pulse "A" amplitude, waveform and timing relative to other waveforms.

(b) Primary command pulse "B" amplitude, waveform and timing relative to other waveforms.

(c) Primary reset pulse amplitude, waveform and timing relative to other waveforms.

(d) Analog sample pulse train output of Multiplexer Programmer amplitude, waveform and timing relative to other waveforms.

(e) Basic clock (bit) frequency.

(f) "Code Multiplexer" Coder Command

(g) Deleted

Test points shall be so designed that inadvertant shorts to ground during testing will not cause permanent damage to, or failure of, the circuit being tested.

3.5.2.1.4 Deleted

3.5.2.1.5 Deleted

3.5.2.1.6 **Life** - The Simulation and Test Equipment shall meet the performance requirements stated herein without major repair, modification, or replacement of major components and with limited maintenance for the following period of time:

Operation Life -- 2000 hours
Storage Life -- shelf and installed but not operating - 2 years.

3.5.2.1.6 (Cont'd) Operation life is defined as that period of time in which only periodic maintenance and minor repairs are necessary. After this period, it shall be possible to renew the operational life after inspection and limited replacement of major sub-assemblies. (F)

3.6

DESIGN REQUIREMENTS - SLED TRANSMITTER SYSTEM

The requirements set forth herein describe a transmitter system, D10-20402-5 for a sled mounted PCM/FM telemetry system. The -5 Transmitter System shall consist of a -9 Exciter Unit, a -10 Unit consisting of a Multiplier and Amplifier, and a -11 Power Supply (See Figure 19). The Multiplier shall multiply the output frequency of the -9 Exciter Unit by a factor of four. Unless otherwise specified in section 3.6, the requirements specified shall apply to the -9, -10, and -11 units operating as a -5 system. With the exception of the inter-unit cables required by the vendor acceptance and flight proof tests, BAC will provide all inter-unit cables. (F)

3.6.1 General Requirements

3.6.1.1 Physical Requirements

All of the physical requirements specified in section 3.1.1.1 are applicable with the exception of paragraphs 3.1.1.1.7, 3.1.1.1.9, and 3.1.1.1.11. (F)

3.6.1.1.1 Construction - The construction of the equipment shall be adequate to obtain the required performance and reliability under the conditions of this specification. The transmitter mounting structure and the transmitter mounting surface may serve as a heat sink and/or function as an RF shield, however the use of the sled structure as a heat sink shall not be contemplated. The removal of any outer insulation skin for the purposes of the bench tests is permitted. If the unit is not sealed, suitable provisions for drainage shall be incorporated to prevent the accumulation of moisture. (F)

3.6.1.1.2 Deleted (F)

3.6.1.1.3 Test Points - Care must be taken in providing electrical test points to ensure that the external loads (such as cable capacitance or inadvertent shorts) introduced by the testing activities does not cause damage to the transmitter system under test. Electrical test points available for use in transmitter system testing shall be sufficient to isolate a fault to a major component plug-in unit. Test points shall be included but not limited to monitor the following parameters: (F)

3.6.1.1.3.1 Heater Voltage and Plate Voltage (F)

3.6.1.1.3.2 Deleted (F)

3.6.1.1.4 Weight - The weight of the equipment shall be the minimum consistent with the requirements of this specification and within the limitations of sound design. The maximum weight entered on the Boeing specification control drawing shall not be exceeded.

NEW B

3.6.1.2	**Electrical Requirements**	
	The electrical requirements of section 3.1.1.2 are applicable with the exception of paragraph 3.1.1.2.3.	(F)
3.6.1.2.1	Deleted	(F)
3.6.1.2.2	Electrical Connections - External connectors shall be located as shown, and shall be of the type specified by BAC Drawing 10-20402. Connectors on plug-in components shall be Cannon Type DA or DE modified to include a moisture seal. RF connectors utilized within the assembly shall be BAC approved.	(F)
3.6.1.3	Environmental Conditions	
3.6.1.3.1	Non-Operative Conditions - The requirements of section 3.1.1.3.1 are applicable.	
3.6.1.3.2	Operative Conditions - The equipment shall be capable of satisfying the performance requirements of section 3.6.2.2 during repeated sled runs (approximately 20 runs) which will subject the equipment to the operating conditions of 3.1.1.3.2 with the exception of 3.1.1.3.2.1.	
3.6.1.3.2.1	Temperature-Continuous equipment operation in ambient air temperature from -10°C to +70°C.	(F)
3.6.1.3.2.2	Altitude - Approximately sea level.	

3.6.1.4 Reliability

Reliability shall be considered as a design factor on an equal basis with other design criteria such as performance, weight, and cost. The reliability of the article shall be such that when integrated into the system of which it is a part, it will perform its design function throughout its required life.

3.6.1.5 Identification of Product

Section 3.1.1.5 is applicable.

3.6.2 **Detailed Requirements**

3.6.2.1 Transmitter System Design Requirements (F)

3.6.2.1.1 Cooling - The equipment shall operate for an indefinite period within the specified temperature range as stated in section 3.6.1.3.2.1 through the use of self contained blowers if necessary.

3.6.2.1.2 Interdependence - The design of the units shall be such that failures will be contained in the faulty unit and will not cause damage in other units. Loss of power supply and/or signal excitation shall not damage the transmitter system. (F)

3.6.2.1.3 Power Source - The transmitter system shall operate from a 28 ± 2 volt DC battery power source with a maximum power drain of 12 amperes. The DC battery power source will have the negative terminal grounded. The transmitter system secondary power supplies and converters shall be designed to provide against the effects of accidental output shorts without damage to the converter. Fuses or circuit breakers will not be utilized in the design. (F)

3.6.2.1.4 Adjustments - The equipment shall operate within the tolerance specified herein during the entire operational life of the equipment while being subjected to the environmental conditions of the adjustments permitted in section 3.6.2.2.2. Any adjustment controls utilized by the vendor shall be positively locked and sealed prior to delivery. Signal inputs and input voltage controls such as switches or relays shall not be utilized. (F)

3.6.2.1.5 The Exciter shall be crystal stabilized. (F)

3.6.2.1.6 Deleted (F)

3.6.2.1.7 Center Frequency - The center frequency of the transmitter system shall be in the 800 to 828 mc megacycles band. (F)

3.6.2.1.8 Modulation - Deleted G

3.6.2.1.9 Feedback Ripple - The system shall contain adequate filtering at its input terminals to eliminate any feedback ripple greater than 1.00% of the primary voltage to the primary power source. The current feedback ripple shall not exceed 1.00% peak of average load current drain throughout the ripple frequency domain. This requirement applies to the -9 and -11 units separately. (F)

3.6.2.1.10 RF Modulating Signal - The transmitter system shall be capable of being frequency modulated by a serial pulse train from the functional programmer (not part of this specification). The characteristics of the pulse train are as follows: (See Fig. 13) (F)

3.6.2.1.10.1 Wave Form - The wave form will consist of non-return-to-zero bits, where the positive level indicates the absence of a pulse, and the negative level indicates the presence of a pulse.

3.6.2.1.10.2 Pulse Frequency - The nominal modulating frequency will be 172.8 kc ± 1%. This assumes an alternate "1" - "0" NRZ bit pattern of 345.6 kilo bits per second ± 1%.

3.6.2.1.10.3 Pulse Amplitude - The pulse amplitude will be two volts ±3% with the positive voltage level at ground reference.

3.6.2.1.10.4 Rise Time and Fall Time - The rise time and the fall time will be 0.3 ± 0.1 micro seconds when driving a 52 ± 0.1% ohm load. (F)

3.6.2.1.11 Bandwidth - All components of the modulated RF carrier signal which are attenuated less than 60 db shall be contained within a 3.0 mc band.

3.6.2.1.12 Transient Potentials - The design of the equipment shall be such as to withstand voltage transients in the power system of 28 ± 12 volts for a maximum duration of 25 milliseconds. E

3.6.2.2 Transmitter System Performance Requirements

With power supplied in accordance with paragraph 3.6.2.1.3 and the transmitter system shall satisfy the following performance requirements. (F)

3.6.2.2.1 Life - The equipment total operating life shall be 500 hours. This life will be accumulated both on the bench and during repeated sled runs. Approximately 20 sled runs are anticipated.

3.6.2.2.2 Power Output - For the frequency specified in paragraph 3.6.2.2.6 the power output of the -10 unit shall be a minimum of 13 watts when operating into a load whose impedance lies on or within a VSWR circle of 2.0 on a Smith Chart normalized to 50 ohms. Two screwdriver type adjustments may be employed in the RF output circuit. These adjustments shall allow an impedance match within the limits specified herein for both power output and frequency stability, and shall be capable of being positively locked. Any maladjustment during bench operation shall not damage the transmitter. Environmental stresses as defined by section 3.6.1.3 shall not alter tuning after adjustment has been made. (F)

3.6.2.2.3 Linearity - The poweroutput shall be constant within ± 0.5 db over the maximum transmitter system deviation. (F)

3.6.2.2.4 Spurious Radiation - All spurious antenna conducted signals shall be at least 60 db down from the carrier level.

3.6.2.2.5 Stability - The modulated carrier frequency shall be stable to within ± 0.01%, including the center frequency tolerance as specified in paragraph 3.6.2.2.6.

3.6.2.2.6 Center Frequency - The center frequency shall be within ± 0.005% of the frequency specified. The specific center frequency will be specified at a later date (the center frequency is defined to be that assigned frequency to which all reference to deviation and modulation are made). (F)

3.6.2.2.7 Modulation Filter Characteristics - The modulating filter shall be a low pass filter with cut-off at approximately 250 kc and a "roll-off" of approximately 18 db/octave. The input resistance of the modulating filter shall be 52 ohms ± 0.1%. (F)

3.6.2.2.8 Modulation Input Sensitivity of -5 - The transmitter system shall have a deviation sensitivity of 500KC plus 0 minus 10%/volt (peak). The transmitter system shall be modulated by a serial NRZ pulse train of "ones" and "zeros", fed to the modulating filter, with a "one" being represented by a -2 volts. A "one" shall cause an RF carrier deviation of 500 Kc in the higher frequency direction (500 Kc above the carrier center frequency) and a "zero" shall cause an RF carrier deviation of 500 Kc in the lower frequency direction (500 Kc below the carrier center frequency). The deviation shall not exceed ± 500 Kc when modulated by pulses having amplitude tolerances specified in paragraph 3.6.2.1.10.3. (F)

3.6.2.2.8.1 Modulation Input Sensitivity of -9 - To achieve the modulation requirement as specified per 3.6.2.2.8, the -9 modulation input sensitivity must be 125% plus 0% minus 10%/volt (peak) which is one fourth of that of the -5 system.

3.6.2.2.9 Primary Power Variation - The transmitter system shall meet the performance requirements specified in this section during system input voltage variations between 26 to 30 volts dc.

3.7 DESIGN REQUIREMENTS, MULTIPLEXER SYSTEM

The design requirements set forth here for a Multiplexer System (10-20402-46) describe the combined functions of a Control Box and Auxiliary Boxes operating as a system. This system, consisting of one Control Box and a maximum of three Auxiliary Boxes shall be referred to as a Multiplexer System for the purposes of specification clarity only (see paragraph 1.4 for a description). Procurement shall be accomplished solely through the use of Control Box and Auxiliary Box identification and the number of units required thereof, that is, Multiplexer System identifications shall not be used for procurement procedures. The 10-20402-46 Multiplexer System shall consist of 10-20402-47 Control Box, 10-20402-48 Auxiliary Boxes and 10-20402-49 through 10-20402-86 Logic Cards.

With the exception of the inter-unit cables required in paragraphs 4.3.4 and 4.5.2.1.1, BAC will provide all inter-units cables.

3.7.1 General Requirements

3.7.1.1 Physical Requirements

All of the general physical requirements specified in section 3.2.1.1 are applicable.

3.7.1.2 Electrical Requirements

All of the general electrical requirements specified in sections 3.2.1.2 are applicable.

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3.7.1.3 **Environmental Conditions**

3.7.1.3.1 **Non-Operative Conditions** -

The equipment shall be capable of satisfying the performance requirements of section 3.7.2 after being subjected to the non-operative environmental conditions of section 3.2.1.3.1.

3.7.1.3.2 **Operative Conditions**

The equipment shall be capable of satisfying the performance requirements of section 3.7.2 while being subjected to the following operative environmental conditions:

3.7.1.3.2.1 **Temperature-Altitude**

An ambient pressure - altitude change from sea level to 90,000 feet altitude within one minute followed by a constant pressure-altitude of 90,000 feet for 2 minutes. Within 1 ½ minutes after missile launch, the equipment will be subjected to thermal radiation from external compartment walls resulting in an ambient air temperature of 400°F. The duration of this ambient will be about 1 ½ minutes. There will be no provisions for ground cooling during the pre-launch period. The ambient temperature on the ground is 110°F.

3.7.1.3.2.2 **Vibration**

Complex vibration, including simusoids as represented by the vibration envelope of Figure 6, and random noise as represented by the vibration envelope of Figure 7.

3.7.1.3.2.3 **Humidity**

Relative humidity to 100%.

3.7.1.3.2.4 **Shock**

Shocks caused by missile engine ignition and cutoff. Excitation of equipment due to shock is considered covered in paragraph 3.7.1.3.2.2.

3.7.1.3.2.5 **Acceleration**

Sustained acceleration of 15g maximum in each of 3 mutually perpendicular axes.

3.7.1.3.2.6 **Acoustical Field**

Sound Pressure levels of 140 db RMS (Re 0.0002 d/cm^2) overall (37 1/2 - 4800 cps) Random. E

3.7.1.3.2.7 **Angular Oscillation**

Maximum and rms excursions as follows about each of three mutually perpendicular axes.

Frequency Range	Maximum Excursion	RMS Excursion
0.5 to 1 cps	1 degree	0.30 degree
1 to 3 cps	0.5 degree	0.15 degree
3 to 12 cps	0.1 degree	0.03 degree
above 12 cps	Determined by local mounting conditions.	

3.7.1.4 **Reliability**

Paragraph 3.2.1.4 is applicable.

3.7.1.5 **Identification of Product**

Paragraph 3.2.1.5 is applicable.

3.7.2 **Detailed Requirements**

All of the Multiplexer unit design requirements of section 3.3.2.1 and performance requirements of section 3.3.2.2 are applicable to the Multiplexer System with the exception of paragraphs 3.3.2.1.2, 3.3.2.1.6.1 and 3.3.2.1.7.

3.7.2.1 System Capacity

The design shall provide for flexibility as specified in paragraph 3.3.2.1.1 within the following command logic capacity limits. The capacity of the System shall be 96 channels at 6400 samples per second maximum with each Auxiliary Box capacity to be 32 channels maximum. Each Auxiliary Box shall be capable of accommodating input signals of 0 to plus 5 volts, 0 to plus 50 millivolts and 0 to +10 millivolts. The assignment of channels for each of the three voltage ranges shall be in multiples of four.

3.7.2.2 Sampling Rate

The Multiplexer System shall be capable of a maximum sampling rate of 6400 samples/second. The Auxiliary Box sampling shall be triggered through the Control Box by command Channel "B" pulses from the Multiplexer Programmer. The Multiplexer System design shall provide for sampling rate flexibility to permit sampling rates: 800; 400; 200; 100; 33 1/3 (samples/second).

3.7.2.3 Cooling

The Multiplexer System may be operated for 36 consecutive hours on the bench at an ambient temperature of 80°F without external cooling. During the pre-launch period and flight, there shall be no external cooling system or equipment for the Multiplexer System. The equipment mounting surface temperature can be approximated by a straight line variation from 150°F at time zero to 200°F at time equal five minutes. The Multiplexer System shall therefore be designed and protected as necessary to perform within limits specified in section 3.3.2.2 while being subjected to the temperature-altitude environmental conditions as described in paragraph 3.7.1.3.2.1.

3.7.2.4 Power Source

Power for the Multiplexer System shall be obtained from the 28 ± 2v interstage source. Maximum current drain shall not exceed 1.15 amps. Secondary power supplies and converters shall be located in the Control Box and shall be designed to provide protection against the effects of accidental output shorts without damage to the converter. Fuses or circuit breakers shall not be utilized in the design. For additional power supply requirements, refer to 3.2.2.1.8 and 3.2.2.1.7. For additional power source information, refer to 3.2.2.1.6.

3.8 DESIGN REQUIREMENTS - LOGIC CARDS

The logic cards in the following subparagraphs are the modular plug-in assemblies which contain the circuitry necessary to perform the specified functions in the 10-20402-41 Multiplexer-Programmer, 10-20402-42 Multiplexer, 10-20402-47 Control Box, and 10-20402-48 Auxiliary Box. The configuration of logic cards for any system is contained in the appropriate Program Control Drawing selected from 21-50000.

3.8.1 Sample and Hold Card 10-20402-49

The Sample and Hold circuitry samples the output voltage from the amplifiers and maintains this voltage output to the encoder for the duration of the encoding period. The sampling time is commanded from the Analog Timing Generator.

3.8.2 Analog Timing Generator Card 10-20402-50

The Analog Timing Generator circuitry generates the following digital signals when commanded by the primary "A" and "B" command pulses from the encoder:

(a) The "A" and "B" read command pulses to drive the Trigger and Reset Circuitry.

(b) The shift triggers to set the Countdown shift bistables.

(c) The gating to the Sample and Hold.

(d) The "B" inhibit pulses to the Analog Sequencer Gate.

3.8.3 Analog Sequencer Gate Card 10-20402-51

The Analog Sequencer Gate circuitry provides four transistor switches for switching an amplifier output to the Sample and Hold when actuated by a channel gate.

3.8.4 Trigger and Reset Card 10-20402-52

The Trigger and Reset Circuitry generates the following digital signals when commanded by the "A" and "B" read command pulses from the Analog Timing Generator and the reset pulse from the encoder:

(a) The read triggers to reset the Countdown shift bistables.

(b) The reset triggers to reset the Countdown counters.

(c) The triggers to the Program Card "B" command pulse divider.

3.8.5 DC to DC Converter, Synchronous Card 10-20402-53

The DC to DC Converter circuitry provides the necessary potentials for operation of the multiplexing circuitry from a 28 volt DC primary power source. The Converter Multivibrator is synchronized to the shift triggers from the Analog Timing Generator to avoid multivibrator switching during Analog signal transmission. The converter also provides the necessary DC isolation of the primary and secondary circuitry.

3.8.6 Low Level 4-Channel Gate Card 10-20402-54

The gate circuitry provides four transistor switches for switching 0 to +10 millivolt analog signal inputs to the low-level amplifier. Dual switching is provided for each channel. When addressed, the channel gate also actuates an analog sequencer gate.

3.8.7 Medium Level 4-Channel Gate Card 10-20402-55

The gate circuitry provides four transistor switches for switching 0 to +50 millivolt analog signal inputs to a medium level amplifier. Dual switching is provided for each channel. When addressed, the channel gate also actuates an analog sequencer gate.

3.8.8 High Level 4-Channel Gate Card 10-20402-56

The gate circuitry provides four transistor switches for switching 0 to +5 volt analog signal inputs to a high-level amplifier. Dual switching is provided for each channel. When addressed, the channel gate also actuates an analog sequencer gate.

3.8.9 5 Volt Voltage and Current Clamp Card 10-20402-57

This voltage and current clamp circuitry provides a calibration or corrective feedback loop for a 5 volt amplifier. The amplifier is corrected before each sampling time.

This 5 volt voltage and current clamp card is used with a 10-20402-61 5 volt amplifier card in a matched 10-20402-80, -83, or -86, 5 volt amplifier and clamp assembly.

3.8.10 50 MV Voltage and Current Clamp Card 10-20402-58

This voltage and current clamp circuitry provides a calibration or corrective feedback loop for a 50 MV Amplifier. The amplifier is corrected before each sampling time.

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3.8.10 (Cont'd) This 50 MV Voltage and Current Clamp card is used with a 10-20402-62 50 MV Amplifier Card in a matched 10-20402-79, -82 or -85 50 MV Amplifier and Clamp Assembly.

3.8.11 10 MV Voltage and Current Clamp Card 10-20402-59

This voltage and current clamp circuitry provides a calibration or corrective feedback loop for a 10 MV Amplifier. The amplifier is corrected before each sampling time.

This 10 MV Voltage and Current Clamp is used with a 10-20402-63 10 MV Amplifier card in a matched 10-20402-78, -81 or -84 10 MV Amplifier and Clamp Assembly.

3.8.12 16 Channel Matrix Card 10-20402-60

The 16 Channel Matrix card provides a grid for installation of diodes in a matrix to selectively drive multiplexer gates in an ordered time-shared sequence. Sixteen channels are controlled from each card. Specific diode configuration for each system is controlled by the appropriate Program Control Drawing selected from 21-50000.

3.8.13 5 Volt Amplifier Card 10-20402-61

The 5 Volt Amplifier is a unit gain amplifier. The amplifier receives 0 to 5 volt differential data signal inputs from high level channel gates, and it provides a single-ended output signal to the Sample and Hold through the applicable sequencer gate.

This 5 Volt Amplifier Card is used with a 10-20402-57 5 Volt Voltage and Current Clamp Card in a matched 10-20402-80, -83 and -86 5 Volt Amplifier and Clamp Assembly.

3.8.14 50 Millivolt Amplifier Card 10-20402-62

The 50 Millivolt amplifier is a gain of 100 amplifier for amplifying data signals of 0 to +50 millivolts to 0 to +5 volts. It receives differential data signals from the medium level channel gates, and it provides a single-ended output signal to the Sample and Hold through the applicable sequencer gate.

This 50 MV Amplifier Card is used with a 10-20402-58 50 MV Voltage and Current Clamp in a matched 10-20402-79, -82 or -85 50 MV Amplifier and Clamp Assembly.

3.8.15 10 Millivolt Amplifier Card 10-20402-63

The 10 Millivolt amplifier is a gain of 500 amplifier for amplifying data signals of 0 to +10 millivolts to 0 to +5 volts.

It receives differential data samples from the low level channel gates, and it provides a single-ended output signal to the Sample and Hold through the applicable sequencer gate.

This 10MV Amplifier Card is used with a 10-20402-59 10MV Voltage and Current Clamp Card in a matched 10-20402-78, -81 or -84 10MV Amplifier and Clamp Assembly.

3.8.16 Countdown IA Card 10-20402-64

The Countdown IA circuitry consists of seven binary counter stages. This countdown is cascaded to a 10-20402-67 Countdown IIB card to provide the counter for the 128 channel portion of the Area "C" Multiplexer.

The shift-bistable, drive and reset for this countdown are provided by the Countdown IIB circuitry. The output signals from the counters are AND gated with the shift bistable to provide logic signals to the Matrix for driving the channel gates. See Figure 21 for area designations.

3.8.17 Countdown IIA No. 1 10-20402-65

The Countdown IIA No. 1 Circuitry consists of the following:

(a) Two binary counter stages providing a three to one countdown.

(b) A shift bistable generator for driving the countdown.

(c) Pulse circuitry for generating "Start" and "Stop" signals for the Voltage and Current Clamps.

(d) Three pulse amplifiers for amplifying the trigger signals from the channel gates which activate the sequencer gates.

This countdown is cascaded to a 10-20402-66 Countdown IB card to provide the Area "A" counter for command * * input signals at 6400 pulses per second when using Program No. 1 or 3 cards, and the Area "B" counter for command * input signals at 6400 pulses per second when using Program No. 2 card. The logic circuitry is driven by the shift and reset triggers from the trigger and reset card and the read triggers from the Program Card. The output signals from the counters are AND gated with shift bistables to provide logic signals to the Matrix for driving the channel gates.

3.8.18 Countdown IB Card 10-20402-66

The Countdown IB Circuitry consists of six binary counter stages. This countdown is cascaded to the 10-20402-65 Countdown IIA No. 1 card to provide; the Area "A" counter for command input signals at 6400 pulses per second when using the Program No. 1 card and the Area "B" counter for command input signals at 6400 pulses per second when using the Program No. 2 card. When the Program No. 3 card is used, this countdown is cascaded to both the 10-20402-65 Countdown IIA No. 1 card in Area "A" and to the 10-20402-72 Countdown IIA No. 2 card in Area "B" to provide the area counters for command input signals at 6400 pulses per second. The shift bistable, drive and reset for these countdowns are provided by the applicable Countdown IIA No. 1 or 2 to which the Countdown IB's are cascaded. The output signals from the counters are AND gated with the shift bistable to provide logic signals to the Matrix for driving the channel gates.

3.8.19 Countdown IIB Card 10-20402-67

The Countdown IIB circuitry consists of the following:

(a) Two binary counter stages providing a three to one countdown.

(b) A shift bistable generator for driving the countdown.

(c) Pulse circuitry for generating "Start" and "Stop" signals for the Voltage and Current Clamps.

(d) Two pulse amplifiers for amplifying the trigger signals from the channel gates which activate the sequencer gates.

This countdown is cascaded to a 10-20402-64 Countdown IA to provide the counter for the 128 channel portion of the Area "C" Multiplexer. The logic circuitry is driven by the read and reset triggers from the Trigger and Reset Card and the shift triggers from the Analog Timing Generator Card. The output signal from the counters are AND gated with the shift bistables to provide logic signals to the Matrix for driving the channel gates.

3.8.20 Countdown IC Card 10-20402-69

The Countdown IC Circuitry consists of five binary counter stages. This countdown is cascaded to a 10-20402-70 Countdown IIC Card to provide the counter for the 32 channel portion of the Area "C" Multiplexer for command input signals at 3200 pulses per second when using Program No. 1 or 2 Card. The shift bistable, drive and reset for this countdown are provided

by Countdown IIC to which it is cascaded. The output signals from the counters are AND gated with the shift bistable to provide logic signals to the Matrix for driving the channel gates.

3.8.21 Countdown IIC Card 10-20402-70

The countdown IIC circuitry consists of the following:

(a) Two binary counter stages providing a three to one countdown.

(b) A shift bistable generator for driving the countdown.

(c) Pulse circuitry for generating "start" and "Stop" signals for the Voltage and Current Clamps.

(d) One pulse amplifier for amplifying the trigger signals from the channel gates which activates a sequencer gate.

This countdown is cascaded to a 10-20402-69 Countdown IC Card to provide the counter for the 32 channel portion of the Area "C" Multiplexer for command input signals at 3200 pulses per second when using Program No. 1 or 2 card. The logic circuitry is driven by the shift and reset triggers from the Trigger and Reset Card and the read triggers from the Program Card. The output signals from the counters are AND gated with the shift bistables to provide logic signals to the Matrix for driving the channel gates.

3.8.22 Countdown ID Card 10-20402-71

The Countdown ID circuitry consists of five binary counter stages. This countdown is cascaded to the 10-20402-72 countdown IIA No. 2 Card to provide; the Area "A" counter for command input pulses at 3200 pulses per second when using the Program No. 2 Card and the Area "B" counter for command input pulses at 3200 pulses per second when using the Program No. 1 Card. The shift bistable, drive and reset for this countdown are provided by the Countdown IIA No. 2 to which it is cascaded. The output signals from the counters are AND gated with the shift bistable to provide logic signals to the Matrix for driving the channel gates.

3.8.23 Countdown IIA No. 2 10-20402-72

The Countdown IIA No. 2 Circuitry consists of the following:

(a) Two binary counter stages providing a three to one countdown.

(b) A shift bistable generator for driving the countdown.

(c) Pulse circuitry for generating "Start" and "Stop" signals for the Voltage and Current Clamps.

(d) Three pulse amplifiers for amplifying the trigger signals from the channel gates which activate the sequencer gates.

This countdown is cascaded to the 10-20402-71 Countdown ID card to provide; the Area "A" counter for command input signals at 3200 pulses per second when using Program No. 2 Card and the Area "B" counter for command input signals at 3200 pulses per second when using Program No. 1 Card. When the Program No. 3 Card is used, this countdown is cascaded to the 10-20402-66 Countdown IB Card in Area "B" to provide the area counters for command input signals at 6400 pulses per second. The logic circuitry is driven by the shift and reset triggers from the Trigger and Reset Card and the read triggers from the Program cards. The output signals from the counters are AND gated with the shift bistables to provide logic signals to the Matrix for driving the channel gates.

3.8.24 12 Volt Regulator No. 1 10-20402-73

This regulator circuitry provides two identical sets of the following:

+ 12 volt regulator, + 6 volt filter and
- 3.6 volt filter.

One set of circuitry is used for the 128 channel portion of the Area "C" Multiplexer, and the other set is used for the 32 channel portion of the Area "C" Multiplexer.

3.8.25 12 Volt Regulator No. 2 (10-20402-74)

The regulator circuitry contains one set of circuits identical to those of the 12 volt Regulator No. 1, paragraph 3.8.24. The card is used in either Area "A" or Area "B" Multiplexers.

3.8.26 Program No. 1 Card 10-20402-75

The Program No. 1 Circuitry receives two 6400 pulses per second "B" command triggers from the Trigger and Reset Card and generates the following Read Triggers:

(a) 3200 pulses per second read triggers to the 32 channel portion of the Area "C" Multiplexer.

(b) 3200 pulses per second read triggers to the Area "B" Multiplexer.

(c) 6400 pulses per second read triggers to the Area "A" Multiplexer.

The Program No. 1 circuitry also contains one analog sequencer gate.

3.8.27 Program No. 2 Card 10-20402-76

The Program No. 2 Circuitry receives two 6400 pulses per second "B" command triggers from the Trigger and Reset Card and generates the following Read Triggers:

(a) 3200 pulses per second read triggers to the 32 channel portion of the Area "C".

(b) 6400 pulses per second read triggers to the Area "B" Multiplexer.

(c) 3200 pulses per second read triggers to the Area "A" Multiplexer.

The Program No. 2 circuitry also contains one analog sequencer gate.

3.8.28 Program No. 3 Card 10-20402-77

The Program No. 3 circuitry receives two 6400 pulses per second "B" command triggers from the Trigger and Reset Card and generates 6400 pulses per second read triggers to both Area "A" and "B" Multiplexers.

3.8.29 10MV Amplifier and Clamp Assembly 10-20402-78

This assembly consists of a 10-20402-59 10MV Voltage and Current Clamp Card and a 10-20402-63 10MV Amplifier Card factory matched for the 128 channel portion of the Area "C" Multiplexer.

3.8.30 50MV Amplifier and Clamp Assembly 10-20402-79

This assembly consists of a 10-20402-58 50MV Voltage and Current Clamp Card and a 10-20402-62 50MV Amplifier factory matched for the 128 channel portion of the Area "C" Multiplexer.

3.8.31 5V Amplifier and Clamp Assembly 10-20402-80

This assembly consists of a 10-20402-57 5 Volt Voltage and Current Clamp Card and a 10-20402-61 5 Volt Amplifier Card factory matched for the 128 channel portion of the Area "C" Multiplexer.

3.8.32 10MV Amplifier and Clamp Assembly 10-20402-81

This assembly consists of a 10-20402-59 10MV Voltage and Current Clamp Card and a 10-20402-63 10MV Amplifier Card factory matched for the 32 channel portion of the Area "C" Multiplexer.

3.8.33 50MV Amplifier and Clamp Assembly 10-20402-82

This assembly consists of a 10-20402-58 50MV Voltage and Current Clamp Card and a 10-20402-62 50MV Amplifier Card factory matched for the 32 channel portion of the Area "C" Multiplexer.

3.8.34 5 Volt Amplifier and Clamp Assembly 10-20402-83

This assembly consists of a 10-20402-57 5 Volt Voltage and Current Clamp Card and a 10-20402-61 5 Volt Amplifier Card factory matched for the 32 channel portion of the Area "C" Multiplexer.

3.8.35 10MV Amplifier and Clamp Assembly 10-20402-84

This assembly consists of a 10-20402-59 10MV Voltage and Current Clamp Card and a 10-20402-63 10MV Amplifier Card factory matched for the Area "A" and "B" Multiplexers.

3.8.36 50MV Amplifier and Clamp Assembly 10-20402-85

This assembly consists of a 10-20402-58 50MV Voltage and Current Clamp and a 10-20402-62 50MV Amplifier Card factory matched for the Area "A" and "B" Multiplexers.

3.8.37 5 Volt Amplifier and Clamp Assembly 10-20402-86

This assembly consists of a 10-20402-57 5 Volt Voltage and Current Clamp Card and a 10-20402-61 5 Volt Amplifier Card factory matched for the Area "A" and "B" Multiplexers.

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3.9 DESIGN REQUIREMENTS - ACCESSORY EQUIPMENT

The accessory equipment described herein shall be designed to operate with, function with, or supplement the handling of the Airborne Multiplexer Equipment and Simulation and Test Equipment of this specification.

3.9.1 Extension Card

This card provides an extension of wiring and circuits from a logic card installation position of multiplexer units beyond the periphery of that unit. A connector is provided on the card for installation of a logic card. This makes the logic card connector circuits available for test purposes for either dynamic (operational) or static (non-operational) conditions.

3.9.1.1 Extension Card 10-20402-30

This card shall provide the facility of paragraph 3.9.1 and shall extend the logic card circuits approximately one inch beyond the unit periphery. This card is applicable to all multiplexer equipment units.

3.9.1.2 Extension Card, Double, 10-20402-39

This card shall provide the facility of paragraph 3.9.1 and shall extend the logic card circuits approximately one inch beyond the extended limits of a logic card which has been installed on an extension card of paragraph 3.9.1.1.. This card is applicable to all multiplexer equipment units.

3.9.2 Extractor, Card

The card extractors described herein are required special tools, allowed in sections 3.2.1.1.4 and 3.5.1.1.1. These tools shall be designed to remove modular cards from the respective containing equipment units without marring, scratching, distorting or damaging the cards or containing equipment in any way. The design of the tool shall be of minimum complexity consistent with its functional requirement.

Materials shall be consistent with use in an environment described for the equipment of section 3.5. Where necessary, corrosion resistant materials or commercial plating processes may be used to protect against corrosive atmosphere. The design shall be such as to provide a tool of comparable quality and ruggedness of high grade commercial mechanic hand tools.

3.9.2.1	Extractor, Card - Multiplexer Equipment (10-20402-43) This tool shall be designed to remove logic cards from the multiplexer-programmer, Multiplexer, Control Box, and Auxiliary Box. The general requirements of 3.9.2 apply.	New G
3.9.2.2	Extractor, Card Simulation and Test Equipment (10-20402-68) This tool shall be designed to remove modular cards from the Simulation and Test Equipment. The general requirements of 3.9.2 apply.	H
3.9.3	Structural Card The Structural Card shall be designed to replace a functional logic card in a Multiplexer Programmer, Multiplexer, Control Box or Auxiliary Box. The purpose of this card is to provide structural integrity of the unit in which it is installed when a functional module is removed and not required for the operation of the multiplexer equipment. This card shall be mechanically identical to the functional Logic Card, except that no electrical circuitry shall be provided. Connector pin connections shall not be connected together or complete any circuit which would cause an operational malfunction of equipment when installed in any card position. The Design and Test requirements for the equipment of section 3.2, 3.3, 3.7, and 3.8 are applicable.	
3.9.3.1	Structural Card 10-20402-45 This card shall be designed to replace any logic card in the multiplexer equipment which is not required for the operation of the multiplexer equipment. The general requirements of 3.9.3 are applicable.	
3.9.4	Mounting Assembly No. 1, 10-20402-87 This mounting assembly shall be used on the 10-20402-41 Multiplexer-Programmer in the Instrumentation Compartment. Four assemblies are required for mounting each unit.	J
3.9.5	Mounting Assembly No. 2, 10-20402-88 This mounting assembly shall be used on the 10-20402-47 Control Boxes and the 10-20402-48 Auxiliary Boxes in the interstages. Four assemblies are required for mounting each unit.	J

4.0 QUALITY ASSURANCE PROVISIONS

4.1 CLASSIFICATION OF TESTS

The inspection and testing of the equipment procured under this specification shall be classified as indicated in paragraphs 4.1.1, 4.1.2, and 4.1.3.

4.1.1 ACCEPTANCE (VENDOR FUNCTIONAL) TESTS

Acceptance tests are those tests which shall be accomplished by the Vendor on equipment submitted for acceptance under contract. Acceptance testing is generally divided between "Individual Tests" and "Sampling Tests". "Component Tests" may also be included as a type of an Acceptance Test.

Individual tests described in paragraph 4.3.2, 4.3.3, 4.3.4, . . shall be performed on equipment to be delivered as spares. Items which are components of a given system need not be subjected to those portions of the tests described which are performed at system level for acceptance test purposes. The level of testing may be revised upon BAC approval. H K

4.1.1.1 SEVERITY OF TESTS - Acceptance tests shall not have detrimental effects on the operational life of the equipment but shall assure that each production article is the equal of that which successfully passed the pre-production tests.

4.1.1.2 TEST PROCEDURE - The Vendor shall provide the Buyer with a detailed description, in document form, of the proposed acceptance test procedure and equipment sufficiently early for BAC comment and approval prior to the scheduled start of acceptance testing. The approval of the procedure and equipment by BAC does not relieve the Vendor of the responsibility to assure that the tests adequately prove compliance with the specification requirements. Changes to the approved procedure may be made only after BAC concurrance. G

4.1.1.3 RECORDS - Adequate inspection and test records of all acceptance testing shall be kept by the Vendor so that failure and reliability studies may be conducted utilising these records as a reference. A reproducible form as shown in Figure 2 and, supplied by the Buyer or the Vendor using the BAC format, shall be completed for each article tested. The reproducible shall be submitted to the Buyer and a copy included with each article tested.

4.1.2 PREPRODUCTION (QUALIFICATION OR FLIGHT PROOFING) TESTS

Preproduction (qualification or flight proofing) tests are those tests accomplished on a representative production article at the place of manufacture or at any approved testing laboratory to establish product compliance with this specification. Tests will be in accordance with the applicable paragraphs of paragraph 4.5 of this specification.

4.1.2.1 TEST PROCEDURE - The Vendor shall provide the Buyer with a description of the proposed test procedure and equipment sufficiently early for BAC comment and approval prior to the scheduled start of preproduction testing. The approval of the procedure and equipment by BAC does not relieve the Vendor of the responsibility to assure that the tests, when performed, adequately prove compliance with all requirements of the specification.

4.1.2.2 CHANGES NECESSARY TO COMPLETE TESTS - All changes made necessary by the failure of a unit to pass the complete preproduction test shall be incorporated at the Vendor's place of business on all future units shipped to BAC. A

4.1.2.3 PROOF REQUIRED OF TESTS - The Vendor shall test the unit in such a manner as to conclusively prove to the extent specified under paragraph 4.5 that the requirements of the applicable paragraph of Section 3.0 have been met.

4.1.2.4 RECORDS - Adequate records of all preproduction testing shall be kept by the Vendor to support failure and reliability studies and results presented in the test reports of paragraph 6.4.4.2.

4.1.3 BAC RECEIVING INSPECTION & FUNCTIONAL TESTS

Receiving inspection and functional tests are performed by the Buyer to insure that articles are satisfactory before their incorporation in an end product.

NOTE:

The BAC inspection and functional test requirements included in this specification are primarily intended for the use of BAC personnel. Although they may be useful to the Vendor as a guide, they shall not be considered as establishing the quality limits on design requirements of the article.

4.2 TEST CONDITIONS

4.2.1 Atmospheric Conditions

Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of 28 to 32 inches of mercury, a temperature of 75°F plus or minus 10°F, and a relative humidity of 80% or less. Where tests are made with atmospheric pressure or temperature substantially different from the above values, proper allowance shall be made for any change in instrument readings.

4.3 ACCEPTANCE TEST REQUIREMENTS AND PROCEDURES

Acceptance Tests shall be performed on all equipment to confirm compliance with all equipment design and performance requirements as stated in Paragraph 4.1.1.2. The general listings of items to be tested for in the paragraphs which follow shall not limit the scope of testing to confirm equipment, design and performance requirements compliance. Detailed test procedure of paragraph 4.1.1.2 shall be followed for all acceptance tests. Should marginal equipment performance conditions become evident at any time for a parameter not included in Acceptance Test requirements, then tests to check such parameters shall be required to be included as an Acceptance Test procedure.

NOTE:

Reference should be made to paragraph 4.1.1 for general description of acceptance tests.

4.3.1 Acceptance Tests for 10-20402-40 RF Section

The following tests shall be performed on each RF Section shipped.

4.3.1.1 Examination of Product

The package shall be examined for satisfactory compliance with the weight, dimensional, nameplate, finish and workmanship requirements.

4.3.1.2 Performance

With the typical test set up as shown in Figure 14 using standard lab test equipment, the RF Section shall be checked for compliance with performance of Section 3.1 as follows:

1. Power output
2. Modulation Input Sensitivity
3. Stability at Transmitter deviation limits after 5 minutes of operation at each deviation limit.
4. During warm-up the transmitter carrier shall be within the band edges.
5. Center Frequency

The power output check shall be conducted at four representative impedances described on a 2 to 1 standing wave ratio circle on a Smith Impedance Chart.

4.3.1.2.1 The power output and frequency stability shall be conducted at four representative impedances described in a 5 to 1 standing wave ratio circle on a Smith impedance chart during acceptance tests of the first five units.

4.3.1.3 Vibration

While operating the equipment shall be vibrated in accordance with Figure 8 in each of three coordinate directions. The duration shall be one sweep at one octave/minute (approximately 8 minutes in each direction) either upwards or downwards in frequency range. The vibration shall be applied and measured at the attachment points of the equipment to structure. Performance shall be monitored and recorded during this test. The equipment shall perform without failure or malfunction. Upon completion of the above vibration test, a minimum operational test consisting of deviation sensitivity, center frequency, and power output shall be performed with a 28 volt DC power input. K

4.3.2 **Acceptance Tests for Systems and Units**

All Multiplexer Systems to be acceptance tested shall be assembled from logic cards which have satisfactorily completed the card acceptance tests of paragraph 4.3.3 of this specification. The configuration of the multiplexing system shall be in accordance with an applicable program control drawing. The system shall be subjected to the acceptance tests of the following subparagraphs using the 10-20402-44 Simulation and Test Equipment and other standard commercial test equipment that may be required.

If a single 10-20402-41, -42, -47, or -48 unit with a full complement of gate cards is to be acceptance tested, it shall be installed in an accepted system "test bed". The unit shall be tested using the applicable portions of the system test procedure.

4.3.2.1 Vibration

While operating, the equipment shall be vibrated in accordance with Figures 8 and 15 in each of three coordinate directions. The duration shall be one sweep at one octave/minute (approximately 8 minutes in each direction) either upwards or downwards in frequency range. The vibration shall be applied and measured at the attachment points of the equipment to structure. Performance shall be monitored and recorded during this test. The equipment shall perform without failure or malfunction. Upon completion of the above vibration test, a minimum operational test with a 28 volt DC power input shall be performed to verify the normal operation of each channel.

4.3.2.2 Performance

The final acceptance tests shall verify the following design requirements:

(a) 1000 OHM Accuracy and Linearity
(b) Current Feedback
(c) Format Verification

4.3.2.2 (Cont'd)

(d) Offset
(e) Accuracy - Linearity and Voltage Variation
(f) Analog Sample Duration
(g) Reset Test
(h) Interchannel Modulation
(i) Common Mode Rejection

4.3.2.3 If a single 10-20402-41, -42, -47 or -48 chassis is to be acceptance tested, the following tests shall be performed. Chassis shall have been subjected to normal manufacturing hi-pot continuity check prior to acceptance testing.

4.3.2.3.1 While non-operating, the equipment shall be vibrated in accordance with Figures 8 and 15 (as applicable) in each of three coordinate directions. The duration shall be one sweep at one octave/minute (approximately 8 minutes in each direction) either upwards or downwards in frequency range. The vibration shall be applied and measured at the attachment points of the equipment to structure. No failures shall occur. Upon completion of the vibration, the chassis shall be subjected to 4.3.2.3.2 Performance.

4.3.2.3.2 Performance

The performance test shall be accomplished on a chassis with a full complement of logic cards installed as a single unit in a test bed. Upon completion of the test, the logic cards shall be removed from the chassis and returned to the test bed.

(a) Format Verification

4.3.3 Acceptance Tests for Logic Cards

All logic cards shall be individually tested. All cards shall be accepted at a card test station with exception of the sample and hold and amplifier-clamp assemblies which may be accepted at a system test bed.

4.3.3.1 Test Procedure

The vendor shall provide Boeing with the test procedures used for each card.

4.3.3.2 Spare Cards

Upon satisfactory completion of card tests, the card shall either be designated a spare or shall be inserted into a subsystem. Those cards scheduled for delivery as spares must, prior to shipment, be subjected while non-operative, to vibration in accordance with Figure 8 or Figure 15 as applicable

4.3.3.2 (Cont'd)

in each of three coordinate directions. The duration shall be one sweep at one octave/minute (approximately 8 minutes in each direction) either upwards or downwards in frequency range. The vibration shall be applied and measured at the attachment points of the cards to the structure. Upon completion of the vibration test, the cards shall again be tested according to paragraph 4.3.3.1.

K

Deleted

K

4.3.4 Acceptance Tests for 10-20402-44 Simulation & Test Equipment

The following tests shall be performed on each simulation and test unit shipped.

4.3.4.1 Examination of Product

The product examination requirements of paragraph 4.3.1.1 are applicable.

4.3.4.2 Performance of 10-20402-44

With the aid of standard laboratory test equipment, compliance of the 10-20402-44 Test and Simulation Equipment to the design and performance requirements shall be confirmed per the detailed test procedures of paragraph 4.1.1.2, including:

1. Electrical characteristics of each command pulse.

2. Electrical characteristics of reset pulses.

3. Sequencing of command and reset pulses.

4. Bit rate (frequency).

4.3.4.2 (Cont'd)

5. Time "on" to multiplexer programmer

6. Reset checking capability

7. Capability to resolve sampled data accurately (output compared to input)

8. Capability to operate properly with one or more multiplexer output circuits open or shorted.

9. Capability to operate properly on one command channel with the other command channel open or shorted.

10. Measurement of crosstalk.

11. Printer operation F

12. Examine for inclusion of all physical requirements section 3.5. G

13. Electrical characteristics of all power outputs for multiplexer equipment G

14. External multiplexer analog input facilities to section 3.5 requirements. G H

15. Operational mode requirement compliance (visual display and print display operation). G

16. Test point facilities G

17. Electrical interference Suppression requirements. (This requirement is subject to waiver by BAC for subsequent units if test data for a given unit supports design compliance requirements to the satisfaction of Boeing Engineering). Reference GM07-59-2617A Figure 1. Tests A.1, A.2, B.2 (to 1000 mc. only) D.1, D.4, D.7, D.8 with reports of paragraphs 3.4, 4.1.2 and 4.1.3 (GM07-59-2617A). G H

4.3.5 **Acceptance Tests for 10-20402-5 RF Section**

The following tests shall be performed on each transmitter system shipped.

4.3.5.1 Examination of Product

The package shall be examined for satisfactory compliance with the weight, dimensional, nameplate, finish and workmanship requirements.

4.3.5.2 Performance

With the typical test set up as shown in Figure 14, using standard lab test equipment, the transmitter system shall be checked for compliance with performance of section 3.6 as follows:

1. Power output
2. Modulation Input Sensitivity
3. Stability at transmitter system deviation limits after 5 minutes of operation at each deviation limit.
4. During warm-up the transmitter carrier shall be within the band edges.

4.3.5.3 Vibration

While operating, the equipment shall be vibrated in accordance with Figure 8 in each of three coordinate directions. The duration shall be one sweep at one octave/minute (approximately 8 minutes in each direction), either upwards or downwards in frequency range.

The vibration shall be applied and measured at the attachment points of the equipment to structure. The equipment shall perform without failure or malfunction. Performance limits defined in paragraph 4.3.5.2 shall be verified during and after vibration tests.

4.3.6 **Acceptance Tests for 10-20402-90 HF Section**

The requirements of paragraph 4.3.1 apply.

4.4 COMPONENT TESTS

4.4.1 Component Testing for 10-20402-40, -41, -42, etc.

Not applicable.

4.5 PREPRODUCTION TEST REQUIREMENTS AND PROCEDURES

Preproduction tests shall inclode flight proof testing for the airborne components and qualification testing for the simulation and test equipment.

4.5.1 Preproduction (Flight Proof) Tests for 10-20402-40

The following tests shall be applied to one RF section with the exception of paragraph 4.5.1.6.1 which requires two RF sections. The environmental tests may be performed in any manner except that the mechanical tests (vibration and acceleration) shall precede the climatic tests (temperature-altitude and humidity). Equipment operation referred to in the following paragraphs shall constitute energizing the RF section in accordance with the primary power design requirements of paragraph 3.1.2.1.3, and simulating the input signals into the RF section as defined by section 3.1.2.1.10. The test diagram of Figure 14 shall be used for these tests. Each test article shall be clearly identified such that the unit is distinguishable as a test unit and not a flight article.

4.5.1.1 Examination of Product

The procedures of paragraph 4.3.1.1 are applicable.

4.5.1.2 Vibration

While operating, the equipment shall be vibrated in each of three coordinate axis in accordance with the vibration envelopes of Figure 4 and 5. The sinusoidal and random vibration shall be applied simultaneously and measured at the points of mounting of the equipment to structure. Duration of applied vibration shall be one sweep at 1/2 octave/minute (about 17 minutes in each coordinate direction). During the above vibration, the equipment shall operate without failure or malfunction.

4.5.1.3 Acceleration

While energized, the equipment shall be centrifuged for a minimum of 3 minutes in each direction along 3 mutually coordinate axes at an acceleration of 15g min, i.e. at the point of connection to the centrifuge. The performance of section 3.1.2.2 shall be monitored as practicable. No failure, malfunction or performance outside the limits specified in section 3.1.2.2 shall occur. Upon completion of each centrifuge test, the equipment shall meet the performance limits specified in section 3.1.2.2.

4.5.1.4 Temperature-Altitude

4.5.1.4.1 Pre-Launch Conditions - While non-operative, the equipment shall be subjected to a test chamber pressure corresponding to an altitude of 20,000 feet simultaneously with a temperature of -45°F for 8 hours. The chamber pressure shall then be restored to ambient, and the system operated. The chamber pressure shall then be restored to ambient and the system then operated with no failure or malfunction.

4.5.1.4.2 Flight Conditions for 10-20402-40 - The RF Section shall be operated in the test chamber. Energize and allow heat sink to stabilize at 120°F for 30 minutes. With the equipment operating as described in paragraph 4.5.1, the unit shall be thermally irradiated by an enclosure simulating compartment walls. The enclosure shall be as follows:

(a) The walls and top of the test chamber shall have an emissibity of .25 plus or minus .05.

(b) All sides of the test article shall be located no further than 2.5 inches from the corresponding radiating test chamber walls.

NEW A

4.5.1.4.2 (Cont'd)

(c) The article shall be either suspended or thermally insulated at the attachment points of the test chamber for a heat sink.

(d) Provisions shall be made to heat four walls of the test chamber to 600°F plus or minus 50°F within one minute from stabilized ambient and to maintain the 600°F plus or minus 50°F wall temperature, for three minutes. During the first minute of this portion of the test, the pressure shall be reduced from sea level to 90,000 feet altitude. At the same time, the wall temperature of the enclosure shall be increased to 600°F plus or minus 50°F. The 90,000 feet altitude and the 600°F wall temperature condition shall be maintained for three minutes. The equipment shall perform during and after the test with no failure malfunction or out-of-tolerance performance degradation.

F

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F

4.5.1.4.3 **Altitude** - While operating under a self-imposed ambient temperature, the equipment shall be subjected to a reduction in test chamber pressure from that of sea level to 200,000 feet. The reduction in pressure shall occur within 1.5 minutes and the 200,000 feet altitude condition shall be maintained for 3.5 minutes. The equipment shall perform with no failure, malfunction or out-of-tolerance performance degradation.

4.5.1.5 Humidity

While non-operative, the equipment shall be subjected to 100 cycles of temperature variation at a relative humidity of 95%. Each cycle shall consist of a test chamber temperature of 120°F (49°C) for one hour, followed by a test chamber temperature of 110°F (43°C) for one hour. Upon completion of the 100 cycles, the chamber temperature shall then be lowered to 80°F (27°C) within one hour with the relative humidity maintained at 95%. The equipment shall then be operated under these conditions and shall perform without failure or malfunction and within the limits specified in section 3.1.2.2. C

4.5.1.6 Interference A

The testing procedure and requirements of STL Document GM07-59-2617A are applicable. The specific tests required and the extent thereto shall be as follows: H

TESTS AS LISTED IN FIGURE 1 OF GM07-59-2617A	EXTENT OF TESTING REQUIRED	
A1	To be conducted on input power leads to high voltage power supply. Frequency range 0.15 to 25 Mc.	H
A2	To be conducted on RF transmitter input signal leads over frequency range of 30 cps to 25 Mc.	H
A2	To be conducted on input power leads to high voltage power supply over a frequency range of 30 cps to 25 Mc.	H
B1	To be conducted as specified per GM07-59-2617A over a frequency range of 0.15 to 1000 Mc.	H
B2	To be conducted as specified per GM07-59-2617A over a frequency range of 1000 to 10000 Mc.	H

C2	Antenna Conducted Spurious Emanations. Frequency range of 0.15 to 10000 Mc.	H
D1	To be conducted on input power leads to high voltage power supply over a frequency range of 0.15 to 10000 Mc.	H
D2	To be conducted on input power leads to high voltage power supply. An injected signal of 1.5 volts rms shall be used. Frequency range of 50 to 15000 cps.	H
D3	To be conducted on input power leads of high voltage power supply at frequency of 2 cps.	H
D4	To be conducted per GM07-59-2617A over a frequency range of 0.1 to 10000 Mc.	H
D7	To be conducted per GM07-59-2617A at frequency of 400 cps.	H
D8	To be conducted per GM07-59-2617A at frequency of 400 cps.	H

4.5.1.6.1 Transmitter Cross Modulation

Owing to the intended use with an antenna triplexer, the transmitter shall meet the requirements of paragraph 3.1.2.2.5 when an external signal 15db below the transmitter output power and separated by 5 mc above or below the fundamental frequency is present at the output. The test method is as follows: Two identical transmitters, each with its own modulating source, are to have their outputs interconnected via a resistive network providing 30 watts dissipation, 15 db isolation, and 2:1 or better VSWR. Each transmitter shall be modulated to full amplitude with a sine wave signal, the sample unit at 400 cps and the interfering unit at 1000 cps. Tunable, calibrated output, linear receivers such as those used in STL Document GM07-59-2617A testing shall be connected to the output of the sample unit. The manner of connection, the search for spurious outputs, and the computation of the power level of such outputs shall be identical to the methods used for the test of paragraph 4.3.3.2 of STL Document GM07-59-2617A; in this, the methods are merely suggested, and procuring activity approval of the coupling methods is required.) The full frequency range of 0.15 mc to 10,000 mc shall be scanned. B H H

4.5.1.7 Reliability Tests - Deleted G

4.5.1.8 **Shock**

While non-operative and unpackaged, the equipment shall be subjected to two shock machine shocks in each direction of each axis in which the equipment will be subject to shock inputs from shipment and handling. The shock machine shall produce a shock spectrum within a minus 10 percent to a plus 50 percent of the spectrum shown in Figure 16. Upon completion of the tests, the equipment shall be operated and its performance noted. The equipment shall show no failure, malfunction, or out-of-tolerance performance.

4.5.2 Preproduction (Flight Proof) Tests for Multiplexer Programmer, Multiplexer, and Multiplexer System C

Flight proof tests of the Multiplexer Equipment, including logic cards, shall be performed with the equipment units connected and operating together as an Instrumentation sub-system. An Instrumentation sub-system is defined as one Multiplexer Programmer, one Multiplexer, and two Multiplexer Systems with applicable Logic Cards installed. Equipment operation referred to in the following paragraphs shall consist of energizing the Instrumentation sub-system, simulating input signals into the multiplexers in accordance with section 3.2, 3.3 and 3.7 and utilizing the Simulation and Test Equipment or other Signal Simulation Equipment to simulate signal inputs into the Multiplexer Equipment in accordance with section 3.5. The environmental stresses shall be applied to the Instrumentation sub-system as a whole. Where this is not practicable, the tests shall be applied to each "black box" in turn. If this individual "black box" procedure is followed, all units of the Instrumentation sub-system and related test equipment shall remain interconnected and operating together when operating is required. The environmental tests may be performed in any order except that "the mechanical tests (vibration, acceleration, etc.) shall precede the climatic tests (temperature, humidity, etc.). The tests shall be performed on one set of Instrumentation sub-system equipment. The multiplexer equipment shall be tested for performance with dynamic data input signals. To accomplish this test the multiplexer equipment shall be connected as shown in Figure 22 and operated under the environmental conditions set forth for preproduction testing. Data will be recovered by means of a PCM/FM Telemetry Ground Station and evaluated within the accuracy and resolution capabilities of the equipment of this test configuration. Figure 22 is to be considered a guide for equipment connections and not a specification requirement. It is assumed that changes in connection details will be made where the characteristics of a given test require. (F) H

4.5.2.1 Integrated Performance Criterion

4.5.2.1.1 Test Diagram - During flight proof testing, the equipment shall be interconnected so as to comply in principle with the component configuration presented by Figure 11. H

4.5.2.1.2 Performance Limits - When sub-systems operation is required during flight proof tests, the performance shall be as follows:

4.5.2.1.2 (Cont'd)

One data channel of each representative type shall (each sampling rate, and each amplification level in each multiplexer unit or system) be activated by a known input potential which is stable and readable within 0.05%. All logic functions shall be operating during test and all channels shall be energized. Representative channels shall be monitored throughout testing procedure as in acceptance tests (Section 4.3). (F)

When sub-systems operation is required after flight proof test, all items shall be subject to complete performance portion of the acceptance tests (Section 4.3). G

4.5.2.2 Examination of Product

The procedures of paragraph 4.3.1.1 are applicable.

4.5.2.3 Vibration

4.5.2.3.1 Tests for Multiplexer Programmer (10-20402-41) and Multiplexer (10-20402-42)- With the equipment operating in accordance with paragraph 4.5.2, the Multiplexer Programmer, and Multiplexer, shall be vibrated in accordance with the requirements of 4.5.1.2. G

4.5.2.3.2 Tests for Multiplexer System (10-20402-46) - With the equipment operating in accordance with paragraph 4.5.2, the Multiplexer System (listed above) shall be vibrated in each of three coordinate axis in accordance with the vibration envelopes of Figure 6 and 7. The sinusoidal and random vibrations shall be applied simultaneously and measured at the points of mounting of the equipment to structure. Duration of applied vibration shall be one sweep at1/2 octave/minute (about 17 minutes in each coordinate direction). During the above vibration the equipment shall operate without failure or malfunction and within performance limits specified in section 4.5.2.1.2. G

4.5.2.4 **Acceleration**

4.5.2.4.1 Deleted

4.5.2.5 **Temperature-Altitude**

4.5.2.5.1 Instrumentation Sub-system Pre-Launch Conditions - With the sub-systems equipment non-operative, it shall be subjected to a test chamber pressure corresponding to an altitude of 20,000 feet simultaneously with a temperature of -45°F for 8 hours. The chamber pressure and temperature shall be restored to ambient. After a 45 minute equipment warm-up period, beginning after temperature stabilization of the chamber, the equipment shall be operated in accordance with paragraph 4.5.2 and the performance parameters of section 4.5.2.1.2 verified at these conditions.

4.5.2.5.2 Flight Conditions for Multiplexer Programmer (10-20402-41), Multiplexer (10-20402-42), and Multiplexer System (10-20402-46)

The Multiplexer-Programmer shall be operated in the test chamber with the Multiplexer and Multiplexer System as shown in Figure 17. The chamber temperature shall be maintained at 65°F until the temperature of the equipment (Multiplexer Programmer, and the Multiplexers and Multiplexer System) stabilizes. With the equipment operating as described (paragraph 4.5.2 and section 4.5.2.1.2 for the sub-system). Multiplexer Programmer and Multiplexers shall be thermally irradiated by an enclosure simulating compartment walls. The enclosure as described in Figure 17 shall have the following characteristics:

(a) The interior surfaces of the test chamber shall have an emissivity of .25 ± .05.

(b) The articles shall be either suspended or thermally insulated at the attachment points to the test chamber to prevent the articles from utilizing the test chamber for a heat sink.

(c) Provisions shall be made to heat the entire cylindrical surface of the test chamber to 600°F ± 50°F within one minute from 65°F ambient and to maintain the 600°F ± 50°F wall temperature for four minutes. During the

4.5.2.5.2 (cont) first minute of this portion of the test, the pressure shall be reduced from sea level to 90,000 feet altitude. At the same time, the simulated compartment walls temperature shall be increased to 600° F ± 50° F. The 90,000 feet altitude, 600° F wall temperature conditions shall then be maintained for three minutes. The equipment shall perform with no failure, malfunction or out-of-tolerance performance degradation. G (F)

NOTE: Only one Multiplexer System (10-20402-46) need be subjected to the temperature-altitude environment. However, the other Multiplexer System shall be connected and operated as part of the sub-system and may remain outside the temperature altitude chamber. G H

4.5.2.5.3 Deleted

4.5.2.6 Humidity

While non-operative, the sub-system shall be subjected to 100 cycles of temperature variation at a relative humidity of 95%. Each cycle shall consist of a test chamber temperature 120°F (49°C) for one hour, followed by a test chamber temperature of 110°F (43°C) for one hour. Upon completion of the 100 cycles, the chamber temperature shall be lowered to 80°F (27°C) within one hour with the relative humidity maintained at 95%. The equipment shall then be operated in accordance with paragraph 4.5.2 under these conditions and shall perform without failure or malfunction and within the limits specified in section 4.5.2.1.2.

4.5.2.7 **Interference** A

The testing procedures and requirements of STL Document GM07-59-2617A are applicable. The specific tests required and the extent thereto shall be as follows: H

TESTS AS LISTED IN FIGURE 1 OF GM07-59-2617A	EXTENT OF TESTING REQUIRED	
A1	To be conducted on input power leads to the Multiplexer Programmer and control boxes over a frequency range of 0.15 to 2.5 Mc.	H
A2	To be conducted on all signal input and output leads of the Multiplexer System over a frequency range of 30 cps to 25 Mc.	H
A2	To be conducted on input power leads to the Multiplexer Programmer and Control Boxes over a frequency range of 30 cps to 25 Mc.	H
A2	To be conducted on the analog input cables (transducer inputs) over a frequency range of 30 cps to 25 Mc.	H
B1	To be conducted over the frequency range of 0.015 to 1000 Mc	H
B2	To be conducted over the frequency range of 1000 to 10000 Mc.	H
D1	To be conducted on power input leads to the Multiplexer Programmer and Control Boxes over a frequency range of 0.15 to 10000 Mc.	H
D2	To be conducted on input power leads to the Multiplexer Programmer and Control Boxes. An injected signal of 1.5 volts rms at a primary voltage of 28 volts nominal shall be used. The internal impedance of the primary source shall be 0.75 resistive ohms or less. Frequency range covered is to be from 50 to 15000 cps.	H

4.5.2.7 (Continued)

D3	To be conducted on input power leads to Multiplexer Programmer and Control Boxes at a frequency of 2 pps.	H
D4	To be conducted per GM07-59-2617A. Frequency range of 0.10 to 10000 Mc.	H
D7	To be conducted per GM07-59-2617A. Frequency of 400 cps.	H
D8	To be conducted per GM07-59-2617A. Frequency of 400 cps.	H

4.5.2.8	Deleted	C
4.5.2.9	Shock	
	The provisions and requirements of paragraph 4.5.1.8 are applicable.	
4.5.3	Deleted	P
4.5.3.1	Deleted	P
4.5.3.2	Deleted	P
4.5.3.2.1	Deleted	
4.5.3.2.2	Deleted	P
4.5.3.3	Deleted	P
4.5.4	Preproduction (Qualification) Test for 10-20402-5	
4.5.4.1	Examination of Product	
	Paragraph 4.3.1.1 is applicable.	
4.5.4.2	Vibration	
	With the exception of the requirement for random vibration, the test procedures and requirements of paragraph 4.5.1.2 are applicable.	G
4.5.4.3	Deleted	P
4.5.4.4	Deleted	P

4.5.4.5 Deleted

4.5.4.6 Interference

Paragraph 4.5.1.6 is applicable with one exception: the tests shall be limited to 1000 mc only. (Paragraph 4.5.1.6.1 is not applicable.)

4.5.4.7 Shock

While non-operative and unpackaged, the equipment shall be subjected to two shock machine shocks in each direction of each axis in which the equipment will be subject to shock inputs from shipment and handling. The shock machine shall produce shocks of 100g with rise times of 6 milliseconds. Upon completion of the tests, the equipment shall be operated and its performance noted. The equipment shall show no failure, malfunction, or out-of-tolerance performance.

4.5.5 Preproduction Tests for Accessory Equipment

4.5.5.1 Extension Card, Single, 10-20402-30

Preproduction testing is not required.

4.5.5.2 Extension Card, Double, 10-20402-39

Preproduction testing is not required.

4.5.5.3 Extractor Card - Multiplexer Equipment, 10-20402-43

Preproduction testing is not required.

4.5.5.4 Extractor Card - Simulation and Test Equipment, 10-20402-68

Preproduction testing is not required.

4.5.5.5 Structural Card

To be qualified in the tests of paragraph 4.5.2 by use as a replacement for a 10-20402-54, -55, or a -56 4 channel gate card.

4.5.6 Preproduction (Flight Proof) Tests for 10-20402-90

All the preproduction tests specified in section 4.5.1 are applicable with the exception of paragraph 4.5.1.2.

4.5.6.1 While operating in accordance with section 3.1.2.1, the equipment shall be vibrated in each of three coordinate axes in accordance with the vibration envelopes of Figures 4 and 24. The sinusoidal and random shall be applied simultaneously and measured at the points of mounting of the equipment to the structure. Duration of applied vibration shall be one sweep at 1/2 octave per minute (about 17 minutes in each coordinate axes). During the above vibration, the equipment shall operate without failure or malfunction and within the performance limits specified in section 3.1.2.2.

4.6 BAC RECEIVING INSPECTION AND FUNCTIONAL TESTS

NOTE:

Reference should be made to paragraph 4.1.3 for general description of BAC testing.

4.6.1 RECEIVING INSPECTION

The Quality Control Department will inspect all articles received for specification conformance as indicated below.

4.6.1.1 PACKAGING AND PACKAGE IDENTIFICATION - For compliance with Section 5.0.

4.6.1.2 IDENTIFICATION MARKING - For compliance with applicable paragraph of Section 3.0.

4.6.1.3 CONSTRUCTION - Compliance with the requirements of the specification regarding outline and mounting provisions and obvious defects or damage.

4.6.1.4 WORKMANSHIP - General quality of workmanship as required by Section 3.0.

4.6.1.5 GENERAL TESTING - BAC reserves the right to test the articles in accordance with any of the requirements of this specification. Inspection may be conducted by either of the following methods with the right reserved to interchange methods (a) and (b) as warranted by the percentage of failures.

(a) Individual (100%) Inspection

(b) Sampling Inspection

4.6.1.6 REJECTED ARTICLES OR LOTS - Articles and/or lots not accepted by BAC Inspection may be resubmitted for complete inspection after the Vendor has given the articles a remedial treatment which will satisfy BAC Inspection that articles meet the requirements of this specification. Before resubmission, full particulars concerning previous rejections and the action taken to correct original defects shall be furnished BAC Inspection. Reworked articles and/or lots shall be submitted for acceptance separately from newly produced items.

4.6.2 Functional Tests for Multiplexer Equipment J

The procedures for functional test to be performed by Boeing are detailed in Boeing document D2-4861. D2-4861 is applicable to 10-20402-41, -42, and -47 through -88 when assembled in a multiplexer system in accordance with an applicable program control drawing selected from 21-50000. If a single 10-20402-41, -42, -47, or -48 unit with a full complement of logic cards is to be functional tested, it shall be installed in a system "test bed" and tested per D2-4861 using an applicable program control drawing. There are no functional test requirements for 10-20402-41, -42, -47, or -48 chassis or for the 10-20402-49 through -86 logic card assemblies when received individually. When individual chassis or logic cards are installed in a multiplexer unit, the applicable functions shall be tested per D2-4861.

4.6.3 Functional Tests for 10-20402-44 KG F

The procedures for functional tests to be performed by Boeing are detailed in Boeing document D2-5051.

4.6.4 Functional Tests for Structural Card, 10-20402-45 H

Functional testing of the Structural Card, 10-20402-45 is not required.

4.6.5 Functional Tests for Extension Card, 10-20402-30 J

Functional testing is not required.

4.6.6 Functional Tests for Extension Card, 10-20402-39 J

Functional testing is not required.

4.6.7 Functional Tests for Extractor Card, 10-20402-43 J

Functional testing is not required.

4.6.8 Functional Tests for Extractor Card, 10-20402-68 J

Functional testing is not required.

4.6.9 Functional Tests for Shock Mounting Assemblies, 10-20402-87 & -88

Functional testing is not required.

4.7 QUALITY CONTROL

4.7.1 PRODUCTION CONTROL

The Vendor shall be responsible for the constancy of production and shall guarantee that all production units shall be at least the equal of the unit or units offered for preproduction tests. Sufficient control of all materials, components, and sub-assemblies shall be exercised to assure that the articles, when completed, shall be uniform and meet the requirements of the specification.

4.7.2 INSPECTION

The work under this specification shall at all times be open for inspection to authorized representatives of the Buyer and the Government. Records, facilities, supplies, and services required for this inspection shall be furnished by the Vendor. The inspectors may require replacement of items which are defective or which do not otherwise meet specification requirements. An inspection system acceptable to BAC and to the Government shall be maintained by the Vendor. Records of all inspection work by the Vendor shall be available to authorized Buyer and Government personnel.

4.7.3 EVIDENCE OF ACCEPTANCE TEST

All items that have successfully passed the acceptance test shall be so identified by the application of a test acceptance stamp.

5.0 PREPARATION FOR DELIVERY

NOTE:

Unless otherwise specified in the purchase order, packaging, packing, and marking for shipment to BAC shall be in accordance with paragraphs 5.1 and 5.3, as applicable. Articles for shipment to other than BAC shall be in accordance with paragraphs 5.2 and 5.3, when so specified in the purchase order.

5.1 DELIVERY TO BAC

5.1.1 UNIT PACKAGING

Individual containers shall be constructed as to allow removal of parts for inspection purposes without destroying the container or labels affixed thereon. If a paper wrapping is used for the unit, acid free paper shall be used. When possible, the container shall afford equal protection to the unit therein after the container has been opened, the unit removed, inspected, and replaced, and the container resealed without the use of special tools. Packaging of all units shipped to BAC shall provide sufficient protection to ensure delivery of the units to BAC without damage and in a condition capable of meeting the requirements of this procurement specification.

5.1.2 INTERMEDIATE PACKAGING

Where size or other considerations result in more than one unit being packaged within a shipping carton, the units shall be individually packaged within the shipping carton. This requirement is mandatory in order to provide suitable protection and positive identification, during storage and handling after removal of the individual units from the major shipping carton. Any deviation from the above required individual packaging requirement must in all cases be approved by BAC prior to shipment of the parts from the Vendor's factory.

5.1.3 SPECIAL INSTRUCTIONS

If the article requires special attention during receiving inspection, installation, and operation, the Vendor shall attach a removable instruction tag to each article. If non-obvious characteristics require an article to be given special handling, the Vendor shall notify BAC and also attach a removable instruction tag to each article.

5.2 DELIVERY TO OTHER THAN BAC

NOTE:

If the Vendor has Packaging Team Authority, for the item(s) covered by this specification, preservation and packaging shall be in accordance therewith; otherwise, the Vendor will be furnished detailed preservation and packaging instructions in accordance with the Boeing Packaging Team Authority.

The above information applies to domestic shipments where limited and extended storage are involved and for overseas shipments.

For domestic shipments intended for immediate use, see paragraph 5.1.

5.3 MARKING

5.3.1 MARKING TEXT

All containers, including individual packages and outer cartons, shall be marked with the following information in the order listed:

(a) Vendor Part Number
(b) Nomenclature
(c) Quantity
(d) Buyer's Purchase Order Number
(e) Vendor's Name and Address
(f) Vendor's Trade Mark (Optional)
(g) Date Packed
(h) Retest or Reinspection Date (if applicable)
(i) Use Before (Date) (if applicable)
(j) Serial Number (if applicable)

NOTE:

Reinspection and "use before" date markings shall be in accordance with ANA Bulletin 405.

5.3.2 BAC SPECIFICATION NUMBER

The BAC specification number shall not appear on the individual packages or on the outer shipping carton unless specified on the purchase order.

5.3.3 SPECIAL MARKING INSTRUCTIONS

When so specified in the purchase order, all units shall have individual and intermediate packages and shipping containers marked in accordance with MIL-STD-129.

6.0 NOTES

6.1 INTENDED USE

6.1.1 Airborne Components

The airborne PCM/FM telemetry components described herein will be used in a telemetry system which will collect, process and transmit data measurements such as vibration, temperature etc,, of a ballistic missile.

6.1.1.2 The 500 hour operating life of the airborne components will be accumulated largely during test and checkout operation on the bench and during various stages of missile assembly. When operated during bench tests, the equipment will be subject to normal laboratory environment. When installed in the missile compartment forced ventilation will be provided during pre-launch only for the Area "C" multiplexer equipment. The Multiplexer Systems Areas "A" and "B" will not be provided with forced ventilation at any time. The final and most critical operation cycle will consist of approximately 30 minutes operation during pre-launch followed by operation under flight conditions as described in section 3. The equipment will not be recovered. (See Figure 21 for area designations) G

6.1.1.3 The equipment must be able to survive normal handling and shipping including air transport in unheated un-pressurized aircraft. Extended storage is not anticipated.

6.1.1.4 Failure of the PCM/FM telemetry equipment during missile flight will result in the loss of data and/or data measurements assigned to the PCM/FM telemetry system necessary to evaluate and improve the weapons system as follows: G

(a) Failure of the RF Section will result in the loss of all PCM/FM telemetry data.

(b) Failure of the Function Programmer (not a part of this specification) will result in the loss of all telemetry data.

(c) Failure of the Coder (not a part of this specification) will result in the loss of all multiplexed analog data.

(d) Failure of the Multiplexer Programmer will result in the loss of all or part of the multiplexed analog data depending on the extent of failure.

(e) Failure of the Multiplexer will result in all or partial loss of analog data from that multiplexer depending on the extent of failure.

6.1.1.4 (cont) (f) Total failure of an area "A" or "B" Multiplexer System will result in the loss of all multiplexed analog data from that Multiplexer System. G

(g) Failure of a Control Box will result in partial or total loss of data from the Multiplexer System of which the Control box is a part depending on the extent of failure.

(h) Failure of an Auxiliary Box will result in the loss of all or part of those analog data measurements assigned to that particular unit of the Multiplexer System depending on the extent of failure. A failure which would cause the loss of the power supply in the Multiplexer System Control Box would cause the total loss of data from that multiplexer system.

6.1.2 Simulation and Test Equipment (10-20402-44) K H

6.1.2.1 The Simulation and Test Equipment described herein will be used during vendor flight proof tests, vendor acceptance tests and Boeing functional tests to provide simulation of certain system input signals and to test certain output performance criteria of the above airborne components.

6.1.2.2 The operating life of the Simulation and Test Equipment will be accumulated entirely in normal laboratory environment. In addition paragraph 6.1.1.3 is applicable.

6.1.2.3 Failure of the 10-20402-44 Simulation and Test Equipment will result in the delay of test programs designed to verify airborne telemetry equipment operation before and during missile installation.

6.1.3 Sled Transmitter

The sled mounted PCM telemetry transmitter described herein will be used as a component in a telemetry system which will collect, process, and transmit data measurements during Holloman AFB sled tests. The use of a special transmitter, as described herein, is dictated by the requirement for operation in the 808-828 mc band. (See Figure 18)

6.1.3.1 The 500 hour operating life of the transmitter will be accumulated both during test and checkout operation on the bench under laboratory environment and when installed in the test sled. Twenty sled runs are anticipated.

6.1.3.2 The equipment must be able to survive normal handling and shipping including air transport in un-heated, un-pressurized aircraft. Extended storage is not anticipated.

6.1.3.3 Failure of this unit would result in loss of sled test data measurements and would delay or deny the completion of PCM/FM-Guidance & Control system integration tests.

6.2 APPROVALS AND CERTIFICATIONS

All approvals clearances and certifications will be recorded in documents D2-10365 "Equipment Certification and Clearance Data for PCM/FM Telemetry Components" and D2-4858 "Status Report Qualification and Approval Program Minuteman Weapon System". Where deviations from the specification design requirements have been granted to the Vendor, the specification shall be either revised to reflect the necessary deviations and the original requirements issued under a different specification dash number or revised by adding an appropriate note to D2-10365 indicating that deviations have been granted. H H

6.2.1 DESIGN PROPOSAL APPROVAL

Assignment of this approval means that the Vendor's design proposal information submitted in compliance with D2-4123 has been approved by the Engineering Department. It does not indicate approval or acceptance of the Vendor's detail design or manufactured article. A

6.2.2 FINAL APPROVAL

Assignment of this approval to the Vendor's article means that:

(a) The required preproduction exhibits, submitted in accordance with 6.4.4, have been approved.

(b) Customer approval has been granted or was not required.

(c) The article is approved for installation, operation, and delivery to Boeing's customer.

6.2.3 TENTATIVE APPROVAL

Assignment of this approval to the Vendor's article means that:

(a) The required preproduction exhibits, submitted in accordance with 6.4.4, have been approved.

(b) Customer approval is required and is pending.

(c) The article is approved for installation and operation.

NOTE:

Final approval and tentative approval are only "type approvals" and do not relieve the Vendor of the responsibility to assure that each article complies with all specification requirements.

6.2.4 FLIGHT CERTIFICATION

Assignment of this certification to the Vendor's article means that:

(a) The required preproduction exhibits have not yet been approved.

(b) There are no operational limitations.

(c) The article is cleared for installation on a limited number of missiles.

6.2.5 LIMITED CERTIFICATION

Assignment of this certification to the Vendor's article means that:

(a) The required exhibits have not been approved. H

(b) There are definite operational limitations.

(c) The article is cleared for system testing and installation on a limited number of non-flight system components H

6.2.6 Operational Certification (Test Equipment)

Assignment of this certification to the Vendor's article means that:

(a) The required preproduction exhibits have not yet been approved.

(b) There are no operational limitations.

(c) The article is cleared for installation on a limited number of nonflight system components.

6.2.7 Limited Certification (Test Equipment)

Assignment of this certification to the Vendor's article means that:

(a) The required preproduction exhibits have not been approved.

(b) There are definite operational limitations.

(c) The article is cleared for system testing and installation on a limited number of nonflight system components.

6.3 DEFINITIONS AND ABBREVIATIONS

NOTE:

Abbreviations appearing in this specification document are in accordance with MIL-STD-12A.

6.3.1 SPECIFICATION DOCUMENT

The specification document which contains all the requirements of the article except those shown on the specification control drawing.

6.3.2 SPECIFICATION CONTROL DRAWING

A supplemental drawing which contains the general outline and other physical requirements of the article and upon which the approval status is recorded.

6.3.3 BOEING PROCUREMENT SPECIFICATION

The specification document and the supplementary specification control drawing.

6.3.4 BUYER

The Material Department of the Boeing Airplane Company or its designated representative.

6.3.5 VENDOR

The manufacturer and/or manufacturer's agent supplying or quoting on the specification article.

6.3.6 SYSTEM COMPONENTS

Any piece of equipment which constitutes a component part of the overall system.

6.3.7 ARTICLE; UNIT; ASSEMBLY; PART; SYSTEM;

All refer to the equipment defined by the procurement specification.

6.3.8 BAC

Boeing Airplane Company, or a subcontracted company which has been granted design responsibility and responsibility for the maintenance of procurement specifications.

6.3.9 END-PRODUCT

The overall article defined by the procurement specification including dash numbered components, if any. However, if a specification covers a number of articles which, though related, are functionally independent of each other and are not intended for use as an integrated assembly, each of the articles shall be considered as an end-product.

6.3.10 RELIABILITY (FOR AIRBORNE EQUIPMENT)

For the purposes of this specification, reliability is defined as the probability of successful completion of operation during the period immediately preceding flight and during flight. A

6.3.11 DISCREPANCY

Any condition where the equipment fails to operate or where operation is out of the limits of the specification when the equipment is subjected to the operational and environmental conditions of the specification.

6.3.12 PCM/FM

Denotes that the RF carrier is frequency modulated and that the information is being transmitted by means of a code of a finite number of symbols representing a finite number of possible values of the information at the time of sampling.

6.3.13 Bit

A single element of data which can be represented by two distinguishable states.

6.3.14 Word

An ensemble of bits, each bit describing a certain function and/or having a prescribed weight as determined by its position on the word.

6.3.15 Analog Sample

A measurement of the data source taken at one instant. Duration of the measurement is dependent on the sampling rate.

6.3.16 **Analog Frame**

The complete iteration of all sampled analog data. This is a function of the lowest commutation rate. H

6.3.17 **Multiplexer Programmer**

The section of the PCM system which processes all the command and reset pulses and distributes these pulses to the multiplexer and multiplexer system. It also distributes primary power to the multiplexer. Analog samples are accepted from the multiplexer and multiplexer system and combined in a single analog sample pulse train to the coder. E

6.3.18 **R&D**

Research and Development

6.3.19 **R&D Primary Power**

The battery supply feeding the airborne telemetry equipment (not the basic missile power supply).

6.3.20 **"Cards" or "Logic Cards"**

Those portions of the multiplexers which are removable for the purpose of inserting other "cards" for different sampling rates etc. These units may be "modules", "printed circuit boards" or other similar removable units.

6.3.21 **Common Mode Signals**

Those potentials common to both lines of a pair which are identical in phase and magnitude.

6.3.22 **"On" Time**

The "on" time of a multiplexer is defined to be the time a multiplexer is sampling a data source.

6.3.23 **Primary Reset Pulse**

A pulse transmitted to the multiplexer programmer as an index command indicating that an analog frame identification code is being generated.

6.3.24 **Reset Pulse**

A pulse generated within the multiplexer programmer as a result of a primary reset pulse, to cause all logic circuits to be oriented in a particular format in the multiplexer programmer and multiplexers.

6.4 DATA REQUIREMENTS

6.4.1 CORRESPONDENCE INITIATED BY VENDOR

6.4.1.1 CORRESPONDENCE IDENTIFICATION - All correspondence, drawings, design information, and other related material concerning this specification shall be identified by this specification number. For example:

REFERENCE: 10-XXXX-X (Part Number and dash number)
BOEING SPECIFICATION CONTROL PART NUMBER

This identification may be hand-lettered on each piece of data and need not appear on the Vendor's original.

6.4.1.2 ADDRESSING - All information and communications transmitted from the Vendor to the Buyer shall be directed to the attention of the appropriate personnel within the particular purchasing department which has requested proposals and/or placed purchase orders.

6.4.1.3 QUANTITIES REQUIRED - All communications shall be furnished in the following quantities:

(a) All correspondence (except preproduction test data) . . . . . 3 copies

(b) Drawings, sketches, etc. . . . . 5 copies or 1 reproducible

(c) Preproduction test data . . . . . 5 copies

(d) Qualification Discrepancy Reports & Acceptance Test Summaries . . . 1 reproducible

6.4.2 CLASSIFICATION OF DATA

6.4.2.1 GOVERNMENT SECURITY - Vendors shall not mark drawings and data with such classifications as "Confidential" or "Secret", unless such classification is mandatory by authority of applicable United States Government security regulations.

6.4.3 EXHIBITS REQUIRED IN VENDOR'S DESIGN PROPOSAL

6.4.3.1 GENERAL REQUIREMENTS -

6.4.3.1.1 Part Number - A specific part number shall be assigned each article for which a design proposal is submitted. The BAC specification control part number shall not be adopted as a Vendor's part number.

NOTE:

The specification control part number of the article may be the same as the SPECIFICATION CONTROL DRAWING number without any dash number suffix (e.g., 10-00000); however, the specification control part number article may sometimes consist of the SPECIFICATION CONTROL DRAWING number followed by a dash number (e.g., 10-00000-2).

6.4.3.1.2 Exceptions or Deviations - The Vendor shall include a list of exceptions or deviations taken to the specifications and the reason for these exceptions.

6.4.3.1.3 Deleted

6.4.3.1.4 Qualification by Similarity - When the article described in this specification is similar to an article previously manufactured by the Vendor and used by BAC, and is constructed of identical materials and/or components and processes, certified test reports of such similar articles and certification that the same or improved construction is used may be accepted in lieu of corresponding qualification tests specified herein. Such reports and certification shall be submitted with the Vendor's design proposal. BAC reserves the right to reject all or any part of such data and require the testing as specified. Acceptance of the data will depend on adequate evidence that the specified article will pass the same tests as the article covered by the reports.

6.4.3.1.5 Deleted

6.4.3.2 Specific Exhibits Required

The seller shall furnish to the Buyer, with his bid submittal the specific exhibits required in the statement of work document, B2-4123.

6.4.3.2.1 Deleted

6.4.3.2.2 Deleted

6.4.3.2.3 Deleted

6.4.3.2.4 Deleted

6.4.4 DATA REQUIRED FOR TENTATIVE AND/OR FINAL APPROVAL

6.4.4.1 PREPRODUCTION ARTICLES - The articles which successfully passed the preproduction tests.

6.4.4.2 TEST REPORTS - Test reports which are certified by the signature of an officer or official of the Vendor's company or subcontracted testing laboratory, and which follows the format of MIL-T-9107, except as noted below shall be submitted in accordance with paragraph 6.4.

(a) The Vendor shall submit to the Buyer either individual test reports or a collective report of the results obtained from subjecting the specified article to the preproduction tests listed in Section 4.0. Unless the testing is unusually complicated, a single collective report is preferred.

In order to expedite the approval of the article, it is requested that interim reports in triplicate be submitted to the Buyer throughout the preproduction testing. These will be used for an initial review only and need not be in the final formal report form.

(b) Test reports from Vendor's and/or their subcontractors shall include a detailed and qualifying description of the test procedures and a detailed summary of the test results. The reports shall also include a complete description of the test machines and/or instruments and shall include reproductions of all laboratory test data sheets dated and identified on all equipments submitted to tests. Graphic, tabular and photographic presentations shall be used to completely illustrate the way the test was conducted and to verify the results obtained from the test. These exhibits shall be submitted to the Buyer so that he can determine that the article being tested does meet the specification and that the testing agencies' conclusions are supported by adequate data.

(c) Test reports shall clearly identify the relation of the data to the requirement it is intended to satisfy.

(d) When revised test report material is submitted, it shall be so marked as to clearly distinguish it from previously submitted material. This provision is necessary as an aid to librarians or other non-technical personnel who must keep filed copies of test reports up-to-date.

6.4.4.2 (d) (cont'd) The use of a revision system similar to that employed in Boeing Procurement Specification documents is encouraged wherein the nature of each change is explained on a "Revision" page, and an index of effective pages reflects the current effectivity of each page.

(e) Beginning with the date of the initiation of actual preproduction testing, a complete test log must be kept of all maintenance, calibration, modification, testing, design changes, etc., relative to or performed on each of the test parts. This log is to form a part of the preproduction test report and must be available to the Buyer at any time. All discrepancies occurring must be entered together with all pertinent information concerning the failures. Cross references shall be made to the Detail Discrepancy Report required by paragraph 6.4.5 of this specification.

(f) During the test, data shall be recorded of the critical performance parameters of the equipment particularly those which provide indication of impending failure or unacceptable shift of calibration. Due to the serious consequences of extended delays to a procurement program, the Vendor should be urged to take as much pertinent data as possible over and above the specification requirements. Such data might assist in rapidly determining the cause of any impending failure and might enable analysis and correction with minimum delay.

(g) No tests conducted prior to the time indicated on the Vendor's test schedule will be allowed as evidence of qualification unless specifically authorized by the Buyer.

6.4.4.3 Deleted

6.4.4.4 PRODUCTION DRAWINGS - The supplier shall furnish the data listed below. This data is necessary in order to meet contract requirements and shall be kept up-to-date concurrently with changes to the part or parts.

6.4.4.4 (cont'd) Original delivery of the below shall be made not later than 15 days subsequent to completion of the individual design or not later than 90 days before delivery of the first article, whichever occurs first.

Forward with letter of transmittal to

Boeing Airplane Company
Seattle Division
P. O. Box 3866
Material Department
Seattle 24, Washington

(a) One vandyke or autopositive (autopositive preferred) copy of each assembly and detail drawing applicable to the part or parts specified on the purchase order.

(1) Each assembly and detail drawing shall be prepared in accordance with the requirements of the latest issue of MIL-D-5028 in effect at date of supplier's quotation. Drawing nomenclature shall be in accordance with MIL-STD-28.

(2) Vandykes or autopositives shall be prepared in accordance with specification MIL-D-5480.

(b) Show applicable Government contract number and Boeing purchase order number in letter of transmittal.

6.4.4.5 ACCEPTANCE TEST PROCEDURES - A description in document form of acceptance test procedures and equipment for the approval of the Boeing Airplane Company.

6.4.5 DISCREPANCIES

6.4.5.1 DISCREPANCY PROCEDURE - Should any discrepancy occur during the preproduction testing, the test shall be stopped. An analysis shall be made of the cause of the discrepancy and changes proposed as necessary to correct the difficulty. The failure shall be entered in the test log of paragraph 6.4.4.2(e) together with an analysis of the cause of failure and the course of action planned to eliminate the difficulty. The Vendor shall forward immediately to the Buyer the Qualification Discrepancy Report (See paragraph 6.4.5.2).

6.4.5.1.1 Design Changes Unnecessary - In the event that the Vendor determines that no design change is necessary, full justification for such action shall be forwarded at once to the Buyer. The Vendor may continue the test; however, he bears full responsibility for so doing until Boeing approval is given of the Vendor's decision. The Buyer will forward comments to the Vendor within 15 days after receipt of the Qualification Discrepancy Report. If BAC disapproves the Vendor's course of action, a mutually acceptable solution must be agreed upon.

6.4.5.1.2 Design Changes Required - Should the Vendor elect to make design changes as a result of a failure, descriptive information must be forwarded immediately to the Buyer. This data shall include a description of how the change was developed, the nature of the change itself, justification that the change will provide adequate design margin to preclude recurrence of similar failures, and evidence that the change will not cause detrimental interaction with other portions of the equipment under test, resulting in other failures at a later date. Redesigned equipment items may be required for examination at Boeing. The Buyer shall forward comments to the Vendor within ten days after receipt of the Qualification Discrepancy Report. If Boeing disapproves, a mutually acceptable change must be agreed upon. The Vendor may incorporate the redesign in qualification test parts and begin the test, but he must not release the change for manufacturing use on items to be delivered under contract to Boeing until receipt of the Buyer's approval.

6.4.5.2 DISCREPANCY REPORTS - A detailed report shall be made by the Vendor on each discrepancy occurring during qualification tests. The report shall include details relating to the failure and corrective action taken to enable Boeing to fully evaluate the problem. Photographs shall be included wherever they contribute to the understanding. The report shall also include a reproducible copy of a completed "Qualification Discrepancy Report" form, see Figure 1, for each discrepancy occurring during the test. Discrepancy Report form will be supplied by the Buyer or the Vendor using the BAC format.

6.4.6	Deleted	(F)
6.4.6.1	Deleted	(F)
6.4.6.2	Deleted	(F)

6.5 CHANGES TO THE ARTICLE OR SPECIFICATION

6.5.2 BAC CHANGES

Changes to the procurement specification may be initiated by the Boeing Airplane Company to revise, add or delete requirements. All Vendors affected will be notified of such changes as soon as possible. All changes will be confirmed in a subsequent revision of the specification.

6.5.1.1 ORALLY - STATED CHANGES - Any orally stated change or intention to change the requirements of the procurement specification is unofficial.

6.5.1.2 OFFICIAL CHANGES - All changes to the procurement specification will be accomplished by revision of the SPECIFICATION CONTROL DRAWING and/or SPECIFICATION DOCUMENT.

6.5.1.3 INTERIM NOTICE OF SPECIFICATION CHANGE - In instances where a specification must be changed immediately, the change may be authorized by a letter or telegram of intention from the Boeing Materiel Department. In this case, the letter or telegram of intention will be followed by a substantiating revision to the specification.

6.5.2 VENDOR CHANGES

6.5.2.1 SPECIFICATION CHANGES - Changes to the procurement specification may be requested by the Vendor or others concerned and, if approved, will be confirmed in a subsequent revision of the specification.

6.5.2.2 CHANGES AFTER DESIGN PROPOSAL APPROVAL - After BAC design proposal approval has been granted, it shall be necessary to obtain written approval of BAC prior to the incorporation of any change affecting physical, functional, or structural interchangeability or weight.

6.5.2.3 CHANGES AFTER TENTATIVE AND/OR FINAL APPROVAL - After tentative and/or final approval have been granted, it shall be necessary to obtain written approval of BAC prior to the incorporation of any change whatsoever. When a change has been approved, revised drawings and data shall be sent to BAC. Revision letters or numbers and dates shall be used to indicate the revision status of each original drawing or data sheet. Where part number changes are not required, serial number effectivity must be noted for all changes.

Additional or repeat qualification testing may be required at the discretion of the Engineering Department.

6.6 SEQUENCE OF BAC-VENDOR NEGOTIATIONS

6.6.1 REQUEST FOR QUOTATION

The Vendor will receive a copy of the procurement specification as part of the bidder's package and an initiation to submit a design proposal. This may include a request for estimate of cost and delivery schedules.

6.6.2 DESIGN PROPOSAL SUBMITTAL

The Vendor's design proposal shall be prepared in accordance with D2-4123 and shall be sent at the time of bid submittal to the Buyer, who will route it to the Engineering Department.

6.6.3 DPA ISSUANCE

Upon evidence that the proposed article will meet specification requirements the Vendor will be notified that Design Proposal Approval has been assigned.

6.6.4 Deleted

6.6.5 PURCHASE ORDER

After DPA has been issued, the Buyer may issue the purchase order.

6.6.6 FINALIZING DESIGN

The Vendor may proceed with efforts toward final design configuration and manufacture. In addition, the Vendor shall prepare a preproduction test plan and submit to the Buyer who will route the data to the Engineering Department for approval. This plan shall include a test schedule per a form provided by the Buyer. When the Vendor receives approval of his test plan, he may proceed with preproduction testing.

6.6.7 CRITICAL DESIGN REVIEW

A critical design review shall be accomplished by BAC Engineering on the equipment at the time the production configuration is established and prior to the start of preproduction testing. This shall be a detail analysis of each part of the equipment with respect to its adequacy to fulfill its function. The Vendor shall make available to BAC sufficient data necessary to perform this review. Design data to be furnished will include but not be restricted to:

(a) Detail production drawings
(b) Circuit diagrams
(c) Detail reliability program
(d) Detailed numerical reliability analysis in which the potential operational reliability figure and/or mtbf of the equipment is calculated. An explanation of the basis for selection of the reliability figure and/or mtbf for the individual parts shall be included.
(e) The Interference Control plan in accord with and within the time specified per paragraph 3.4 of D2-2444. A

The above data shall be furnished on a keep-up-to-date basis.

6.6.8 NOTIFICATION OF TESTING

The Vendor shall notify Boeing at least three days prior to conducting any tests in which data is to be used for qualification purposes. (At this time the Vendor must supply a revised test schedule.) The Buyer will notify the Vendor if Boeing witnesses are required at any or all such tests.

6.6.9 SUBMITTAL OF TEST DATA

The Vendor shall send preproduction data to the Buyer who will in turn route it to the Engineering Department.

6.6.10 GRANTING APPROVAL

If the preproduction data indicates that the article will meet all specification requirements, either tentative or final approval will be assigned.

NOTE:

Ordinarily, an article must be assigned tentative or final approval before it can be installed on production assemblies. Purchase orders will stipulate that no articles shall be shipped before approval has been received. The Buyer, however, may apply for limited or flight (operational) certification and then authorize limited shipment to sustain production until approval is assigned. This application for certification must be accompanied by the data required under paragraph 6.4.4.5.

6.6.11 NOTIFICATION OF APPROVAL

The Vendor will be notified of a certification or approval issued to his article by means of a letter signed by the Buyer and followed up with a revised copy of the Specification Control Drawing. When it is urgent to release manufactured articles for shipment to the Buyer, advance notice of certification or approval may be telephoned, or telegraphed to the Vendor by the Buyer.

6.6.12 APPROVAL OF ACCEPTANCE TEST PROCEDURE

The Vendor's Acceptance Test Procedure, as required by paragraph 6.4.4.5 must be approved by the Engineering Department prior to the shipment of the Vendor's articles.

BOEING AIRPLANE CO. – SEATTLE DIVISION

QUALIFICATION
DISCREPANCY REPORT

No. / BOEING USE

2 DATE OF DISCREPANCY (DAY MO YR.)	6 QUAL. TEST PARAGRAPH NO.	10 TIME METER HRS. MODE / READING	11 BOEING P.O. NO.	12 VENDOR'S NAME & ADDRESS		
3 VENDOR DISCREPANCY NO.	7 QUAL. TEST TIME ON PARTICULAR TEST		13 BOEING SPEC. CONTROL PART NAME	14 BOEING SPEC. CONTROL PART NO.		
4 PREPARED BY	8 TOTAL QUAL. TEST TIME		15 VENDOR ASSEMBLY NAME	16 VENDOR ASSEMBLY NO.	17 VENDOR ASSEMBLY SERIAL NO.	
5 VENDOR APPROVAL	9 BOEING WITNESS		18 VENDOR PART NAME	19 VENDOR PART NO.	20 SPECIFIC PART LOCATION	

21 DESCRIPTION OF DISCREPANCY	23 CORRECTIVE ACTION

FIGURE 1

22 ANALYSIS OF DISCREPANCY	24 FOR BOEING USE
	25 PRODUCT MODEL
	26 PRODUCT SYSTEM
	27 USED ON ASSEMBLY
	28 FINAL RPT. NO. (LIBRARY REFERENCE)
	29 REFERENCE INFORMATION
	30 QUAL. TEST RESPONSIBILITY (NAME OF DESIGN GROUP)

THE RESPONSIBLE DESIGN GROUP SHALL COMPLETE THIS SECTION AND FORWARD TO THE RELIABILITY DATA GROUP WITHIN SEVEN (7) DAYS.

D10-20402
Page 110

BAC 3785

2-7000

FIGURE 1A

PREPRODUCTION DISCREPANCY REPORT INSTRUCTIONS FOR FIGURE 1

This form shall be used to report the details of every discrepancy, malfunction or failure observed on any item, parts, material or assembly during preproduction testing. Photographs shall be included whenever they contribute to the understanding.

The form will be originated by the observer of the discrepancy, malfunction, or failure. It must be complete and accurate as possible.

The form will be reviewed for completeness in the area in which it is originated. After completion, the form will be routed as indicated at the bottom of the form.

1. Serial number of the report.
2. Date discrepancy was detected.
3. Cross reference to vendor report on same discrepancy.
4. Name of observer originating report.
5. Name of person who checks report for completeness and approves.
6. Number of preproduction test paragraph being run when discrepancy occurred.
7. Total running time (hours and minutes) accumulated at time discrepancy occurred for test being run as indicated in item 6.
8. Total preproduction test time (hours) accumulated for all test paragraphs completed prior to this discrepancy.
9. Name of Boeing witness who observed this discrepancy.
10. This block to be completed only for those preproduction test paragraphs which call for more than one operating mode.
11. Number of Boeing purchase order which buys the item being qualified.
12. Name of vendor and the city in which the item is being qualified.
13. Name of part as given in the title of the Boeing procurement specification document.

Figure 1b

14. Number of the Boeing Procurement Specification Drawing with dash numbers as applicable.

15. Name of the Vendor assembly which is discrepant.

16. Assembly number of the Vendor assembly which is discrepant.

17. Serial number of the Vendor assembly which is discrepant.

18. Name of the specific part in the Vendor assembly which is discrepant.

19. Part number of the specific part in the Vendor assembly which is discrepant.

20. Location or reference designator for the specific part in the Vendor assembly which is discrepant.

21. A specific narrative description of background symptoms, environment, actual test values read, operator's comments, and cause of discrepancy if known.

22. Narrative analysis of discrepancy which is made to determine corrective action to be taken.

23. Narrative acount of corrective action taken to correct discrepancy and prevent recurrence.

24-30. For Boeing use only.

31. Routing instructions.

[illegible] ON B[illegible] HARD CARD

[illegible] CONTRACTOR & VENDOR [illegible]

BOEING AIRPLANE CO.
Name of Company Performing Test

[1] MANUFACTURER ____ PAGE ___ OF ___
[2] EQUIPMENT NAME ____
[3] VENDOR PART NO. ____
[4] SERIAL NO. ____
[5] BOEING PROC. SPEC. NO. ____ REVISION DATE ____

[6] TEST REFERENCE No.	Date	[7] TEST DESCRIPTION AND RESULTS List in Order of Completion NOTE: Summarize each failure for each test reference including cause and action taken. Completely identify each failed part.	[8] OPERATING TIME FOR EACH TEST REFERENCE Hours	Min.	Cycles

FIGURE 2

[illegible]: Vendor - Vellum Original, BAC SEATTLE Div. Buyer - Vellum Copy, For Vendor use - Hard Card - Attach to part
Boeing - Vellum Original, SEFAC Rel. Data Group - Vellum Copy, Retain at point of origin - Hard card-Attach to part

9

Figure 2a

ACCEPTANCE OR FUNCTIONAL TEST SUMMARY INSTRUCTIONS FOR FIGURE 2

This form shall be used to report the completion of each test reference or functional test paragraph by number and date in chronological order. All test references shall be listed whether discrepancies occurred or not and shall include operating time and cycles.

The details of every discrepancy, malfunction, or failure observed on any item, part, material, or assembly occurring during functional testing shall be reported in proper order. Photographs shall be included whenever they contribute to the understanding.

1. Name of manufacturer or vendor of item reported on.

2. Name of equipment or item as given in the title of the Boeing Procurement Specification Document.

3. Assembly or part number of the vendor item being reported on.

4. Serial number of the vendor item being reported on.

5. Number of the Boeing Procurement Specification Document and revision date.

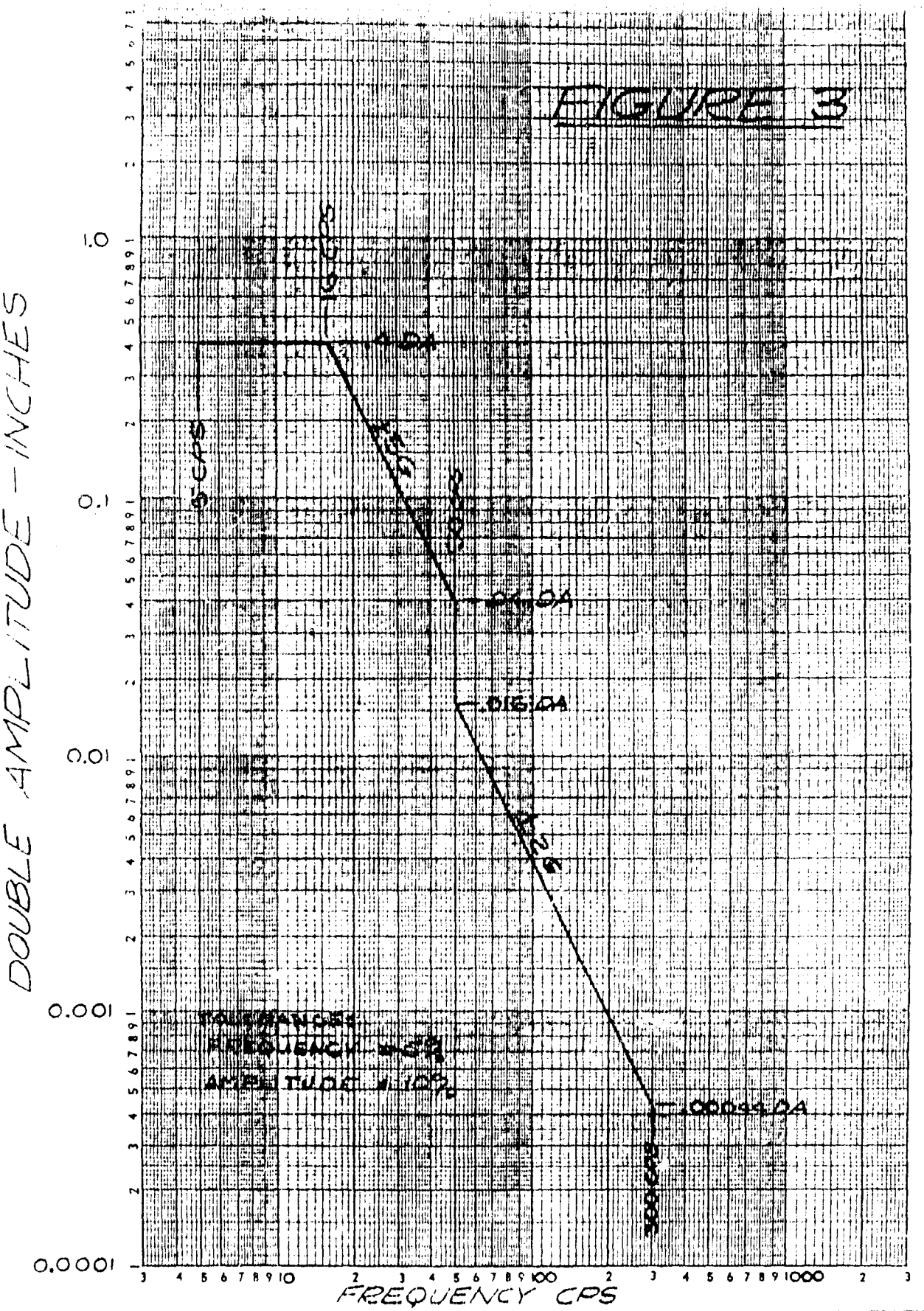
6. Number of the test reference or functional test paragraph and the date on which it was completed.

7. List names of functional tests completed opposite each number and state actual test values read. If no discrepancies occurred during test, so indicate. If discrepancies did occur summarize them opposite the appropriate test number. Each summary shall include cause, if known, and action taken. Any failed parts shall be completely identified.

8. Operating time and cycles accumulated shall be listed for each test reference number.

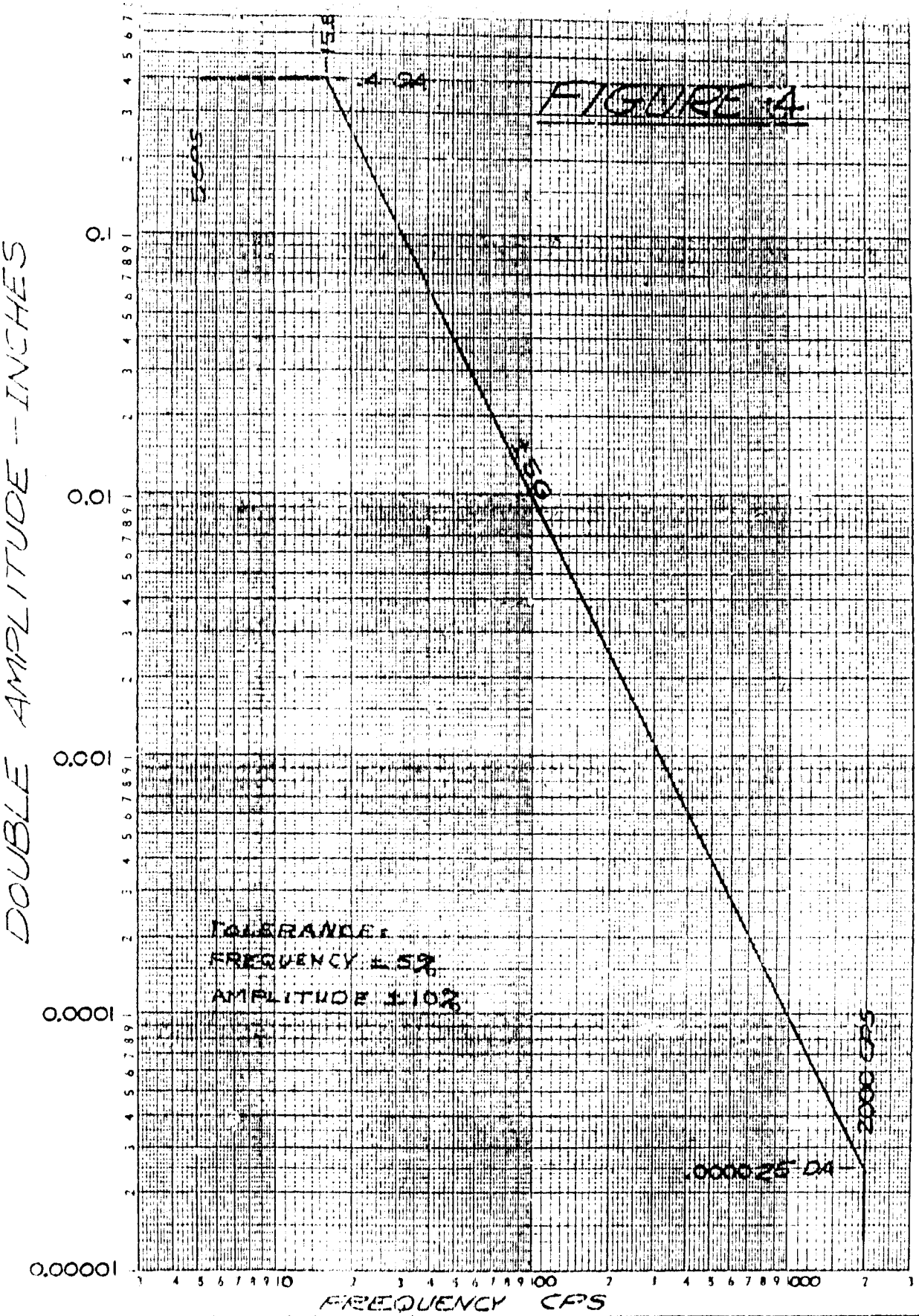
9. Routing instructions.

FIGURE 3



CALC	L. CAMPBELL	3/27/59	REVISED	DATE	SINUSOIDAL VIBRATION	SPECIFICATION NO.
CHECK		A	D.N. M065	5/27/59	ENVELOPE FOR EQUIPMENT	
APPR		E	G.S.		NON-OPERATIVE	D10-20902
APPR		G			BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 145 G

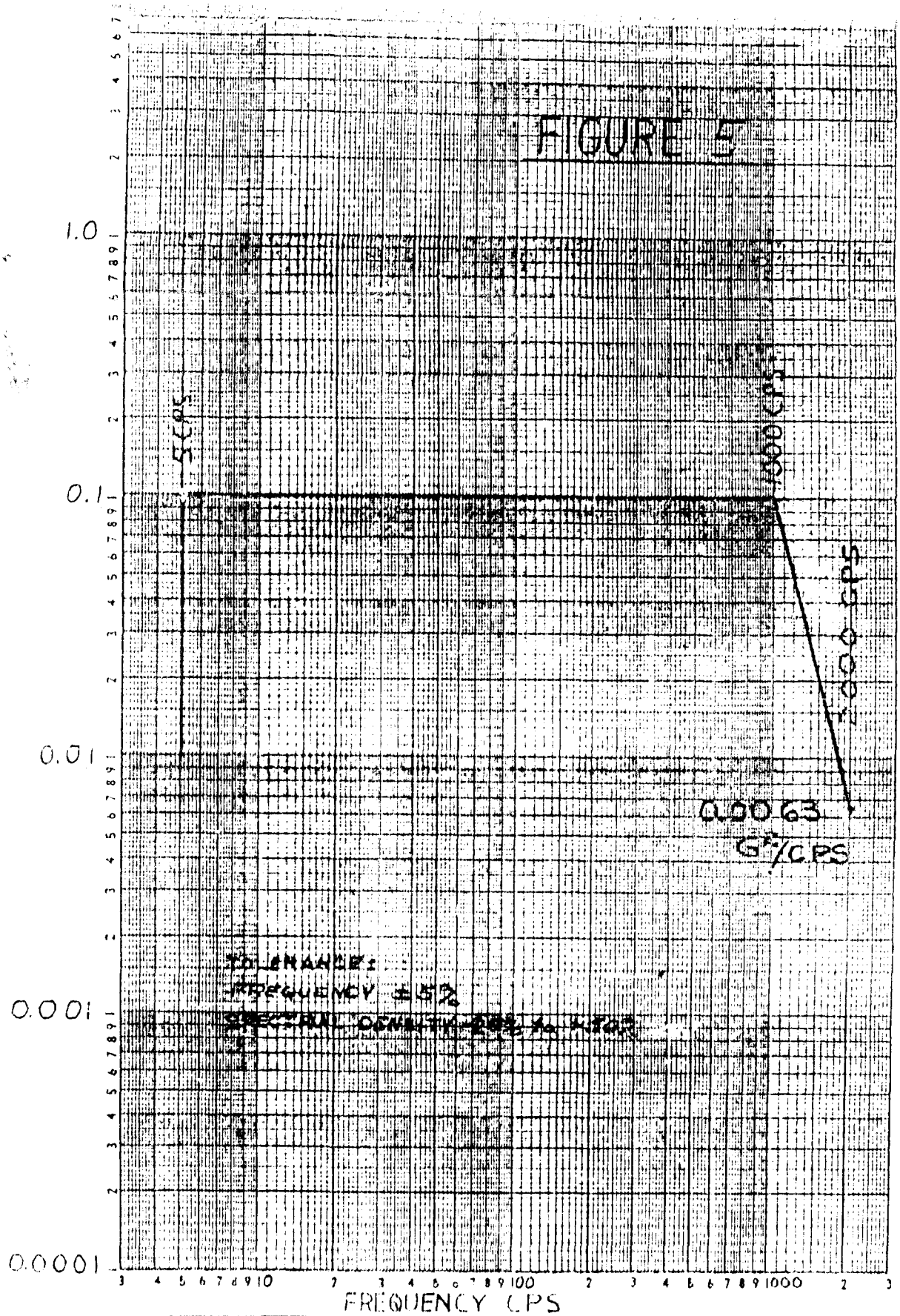
FIGURE 4



CALC	L. CAMPBELL	3/27/59	REVISED	DATE	SINUSOIDAL VIBRATION ENVELOPE FOR EQUIPMENT OPERATIVE (INSTRUMENTATION COMPARTMENT)
CHECK			A D.W. MOGS	5/27/59	SPECIFICATION NO D10-20402
APPR					
APPR					

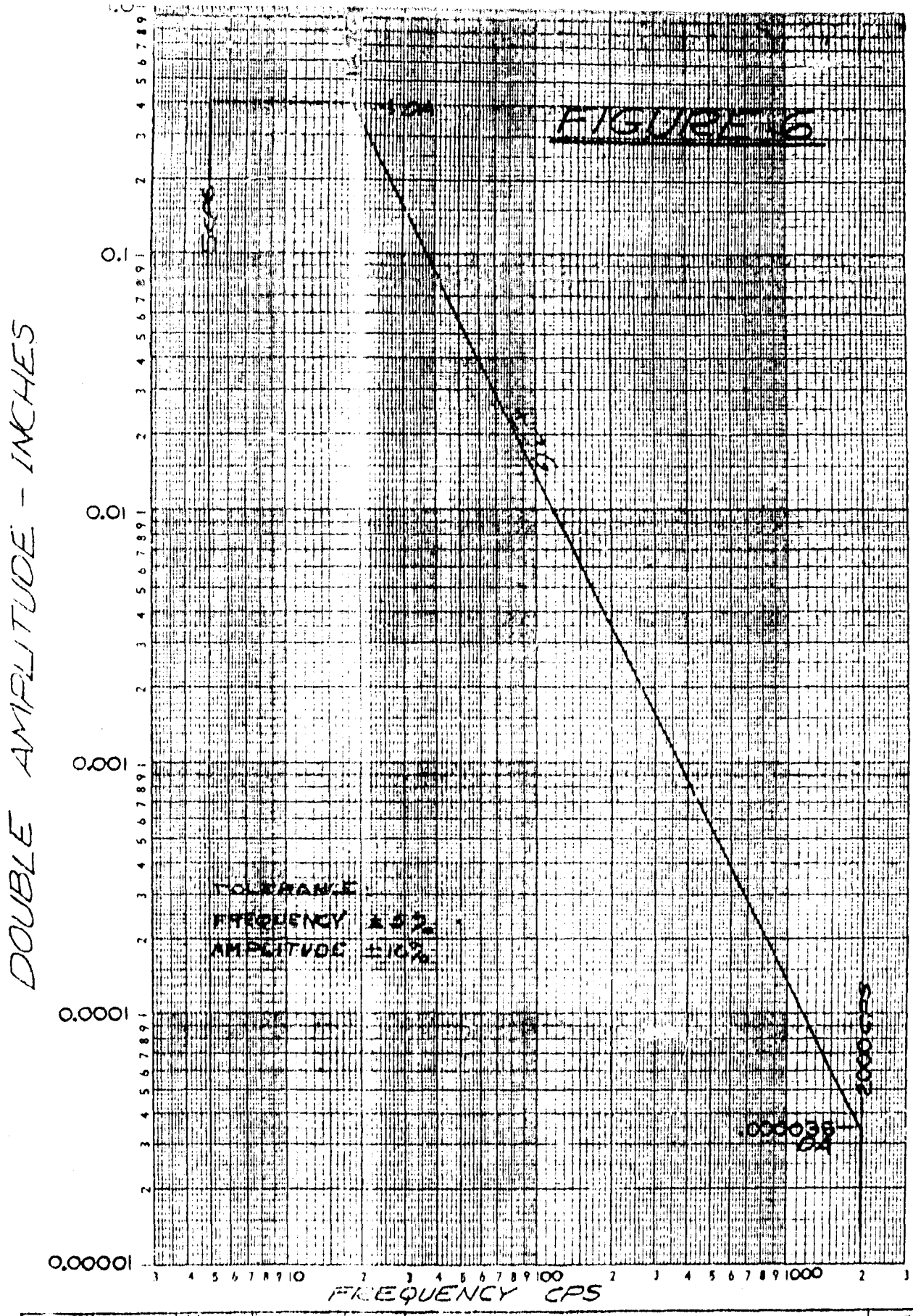
BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

FIGURE 5



CALC	SPB		REVISED	DATE	RANDOM VIBRATION ENVELOPE FOR EQUIPMENT OPERATIVE (INSTRUMENTATION COMP.)	SPECIFICATION NO.
CHECK			A NEW			D10 20402
APPR			G.E.			
APPR			C.E.M.		BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 147

FIGURE 16



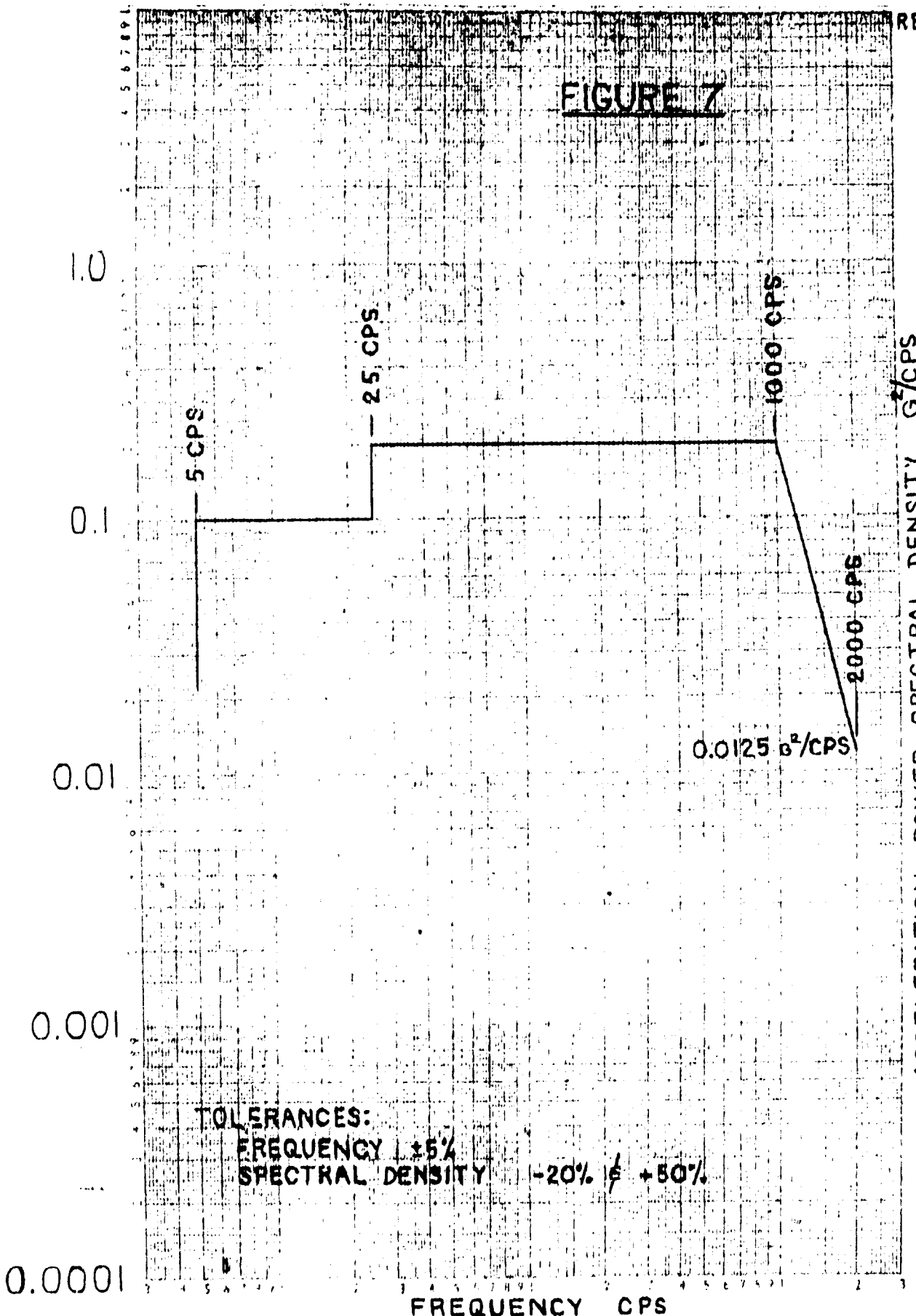
CALC	L. CAMPBELL	4/10/59	REVISED	DATE	SINUSOIDAL VIBRATION ENVELOPE FOR EQUIPMENT OPERATIVE (INTERSTAGES)	SPECIFICATION NO.	
CHECK		A	D. K. MOSS	4/27/9		D10-20402	
APPR		B	G. S.				
APPR		C			BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 148	G

6 7000

REDRAWN

Ⓕ

FIGURE 7

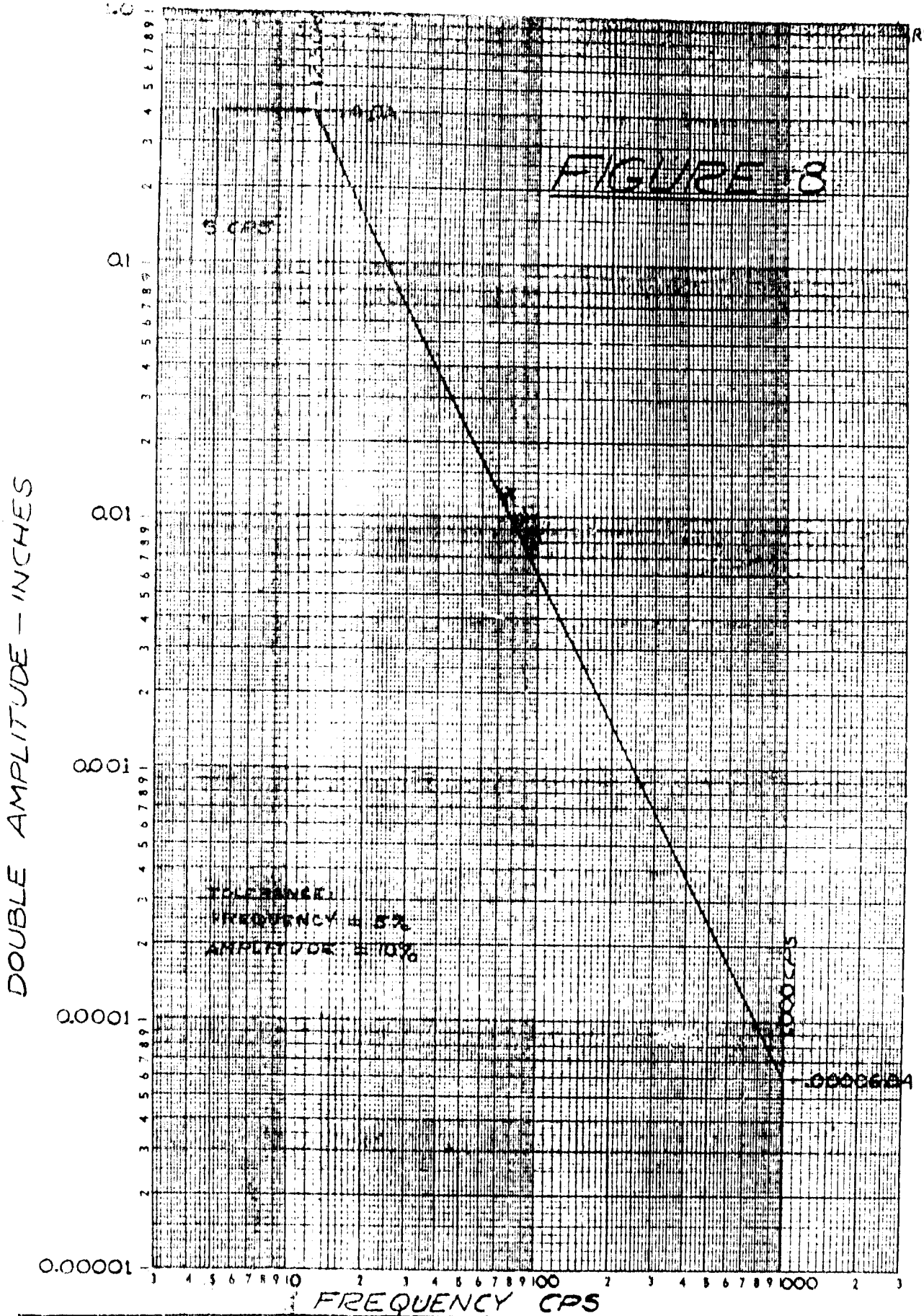


TOLERANCES:
FREQUENCY ± 5%
SPECTRAL DENSITY -20% & +50%

CALC	S.P.B.	D.C.N. LETTER	NEW G.S. K.W. LAH	RANDOM VIBRATION ENVELOPE FOR EQUIPMENT OPERATIVE (INTERSTAGE)	SPECIFICATION NO.
CHECK		A			D10-20402
APPR		E			
APPR		Ⓕ		BOEING AIRPLANE COMPANY SEATTLE, WASHINGTON	PAGE 140
		5			G

REDRAWN

FIGURE 8



CALC	D. W. MKS	5/3/60	REVISED	DATE	SINUSOIDAL VIBRATION ACCEPTANCE TEST ENVELOPE FOR EQUIPMENT OPERATIVE (INSTRUMENTATION COMPARTMENT)
CHECK					SPECIFICATION NO. D10-20402
APPR					
APPR					

BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

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6 7 10 1

FIGURE 9

Deleted

CALC				DATE	SINUSOIDAL VIBRATION ENVELOPE FOR RELIABILITY TESTS
CHECK			LAM	10-5-61	
APPD					
APPD					BOEING AIRPLANE COMPANY

Spec. No. [redacted]-20402

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AC 973 D 83

X-7000

FIGURE TO
DELETED

G

DPT	REVISED / DATE	RANDOM VIBRATION ENVELOPE FOR RELIABILITY TESTS	SPECIFICATION NO. D10-20402
		BOEING AIRPLANE COMPANY	PAGE 152

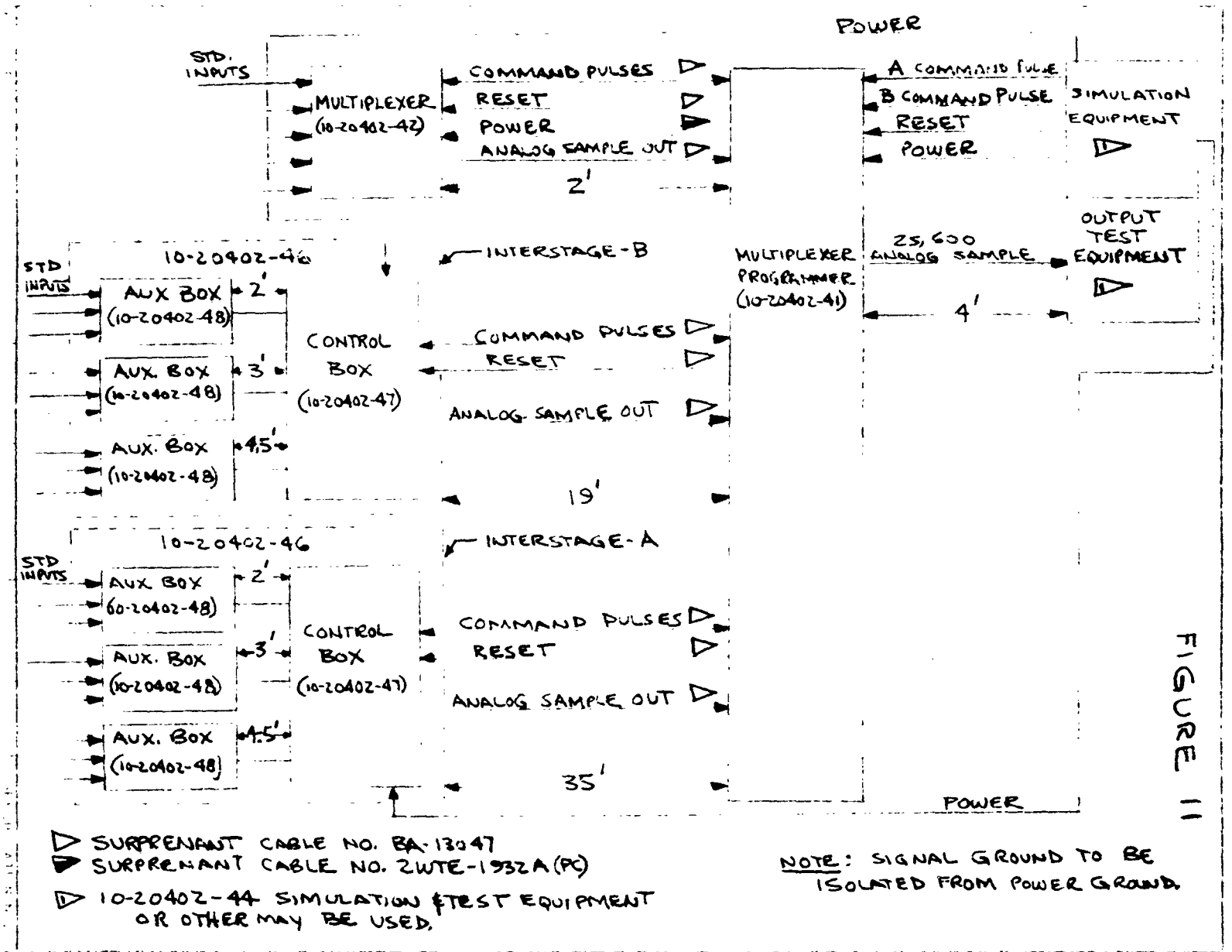
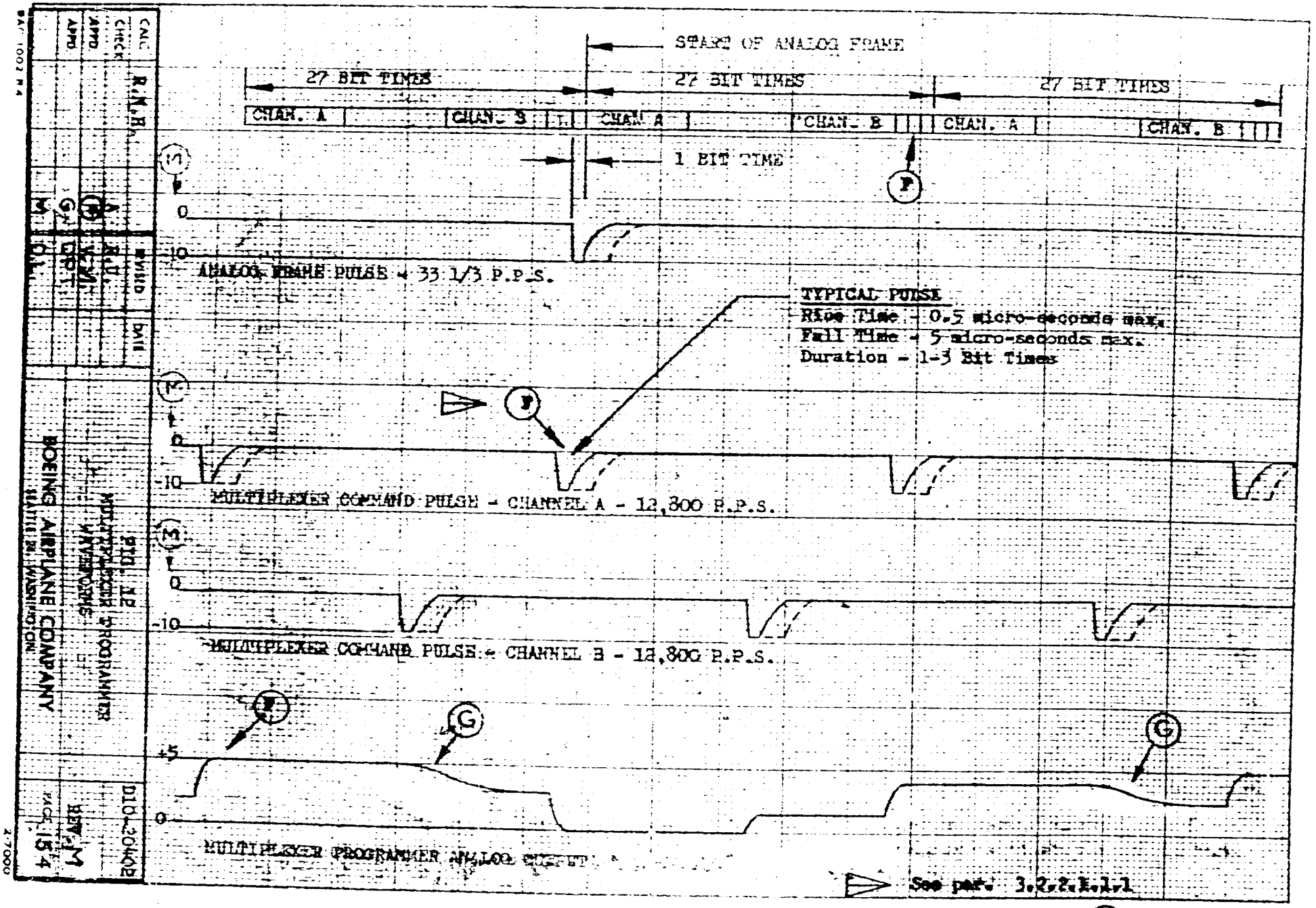


FIGURE 11

TEST DIAGRAM

SPECIFICATION DOCUMENT PAGE

10-20402


START OF ANALOG FRAME
27 BIT TIMES
27 BIT TIMES
27 BIT TIMES
CHAN. A
CHAN. B
CHAN. A
CHAN. B
CHAN. A
CHAN. B
1 BIT TIME
ANALOG FRAME PULSE - 33 1/3 P.P.S.
TYPICAL PULSE
Rise Time - 0.5 micro-seconds max.
Fall Time - 5 micro-seconds max.
Duration - 1-3 Bit Times
MULTIPLEXER COMMAND PULSE - CHANNEL A - 12,800 P.P.S.
MULTIPLEXER COMMAND PULSE - CHANNEL B - 12,800 P.P.S.
MULTIPLEXER PROGRAMMER ANALOG OUTPUT
See par. 3.2.2.1.1.1
BOEING AIRPLANE COMPANY
MULTIPLEXER PROGRAMMER
D10-20402-2

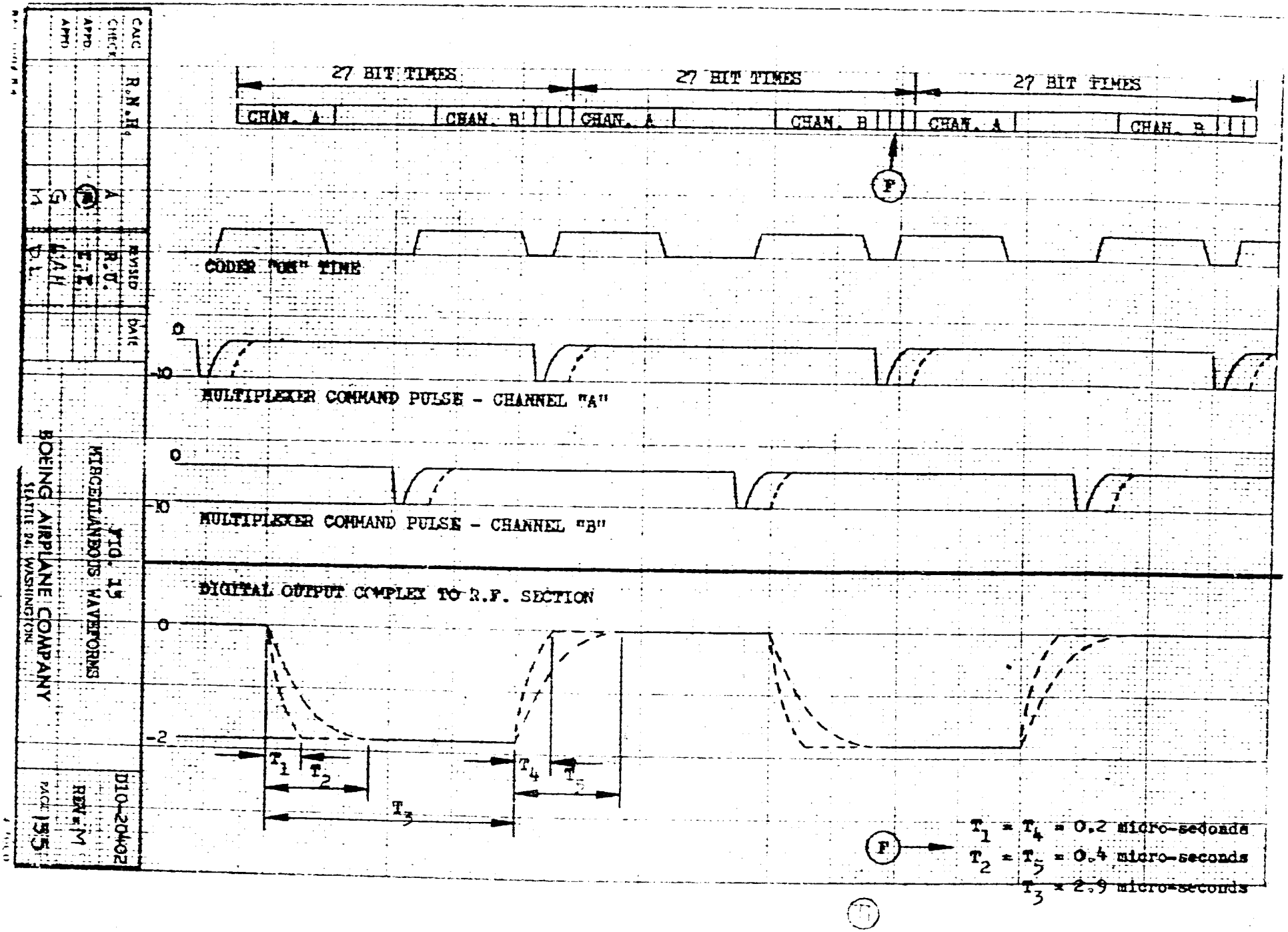


FIG. 15
MISCELLANEOUS WAVEFORMS

BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

D10-20402
REV. M
PAGE 155

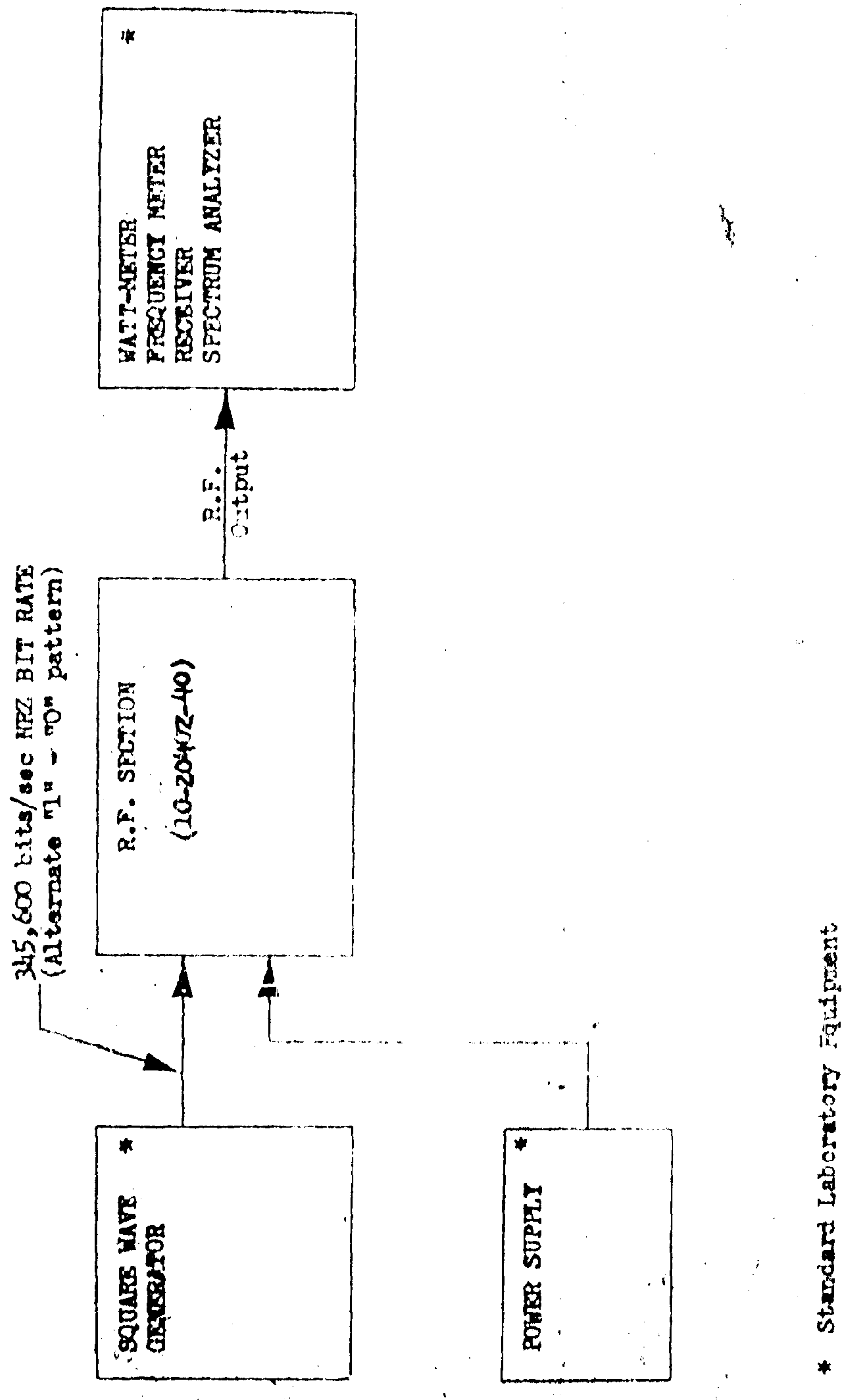
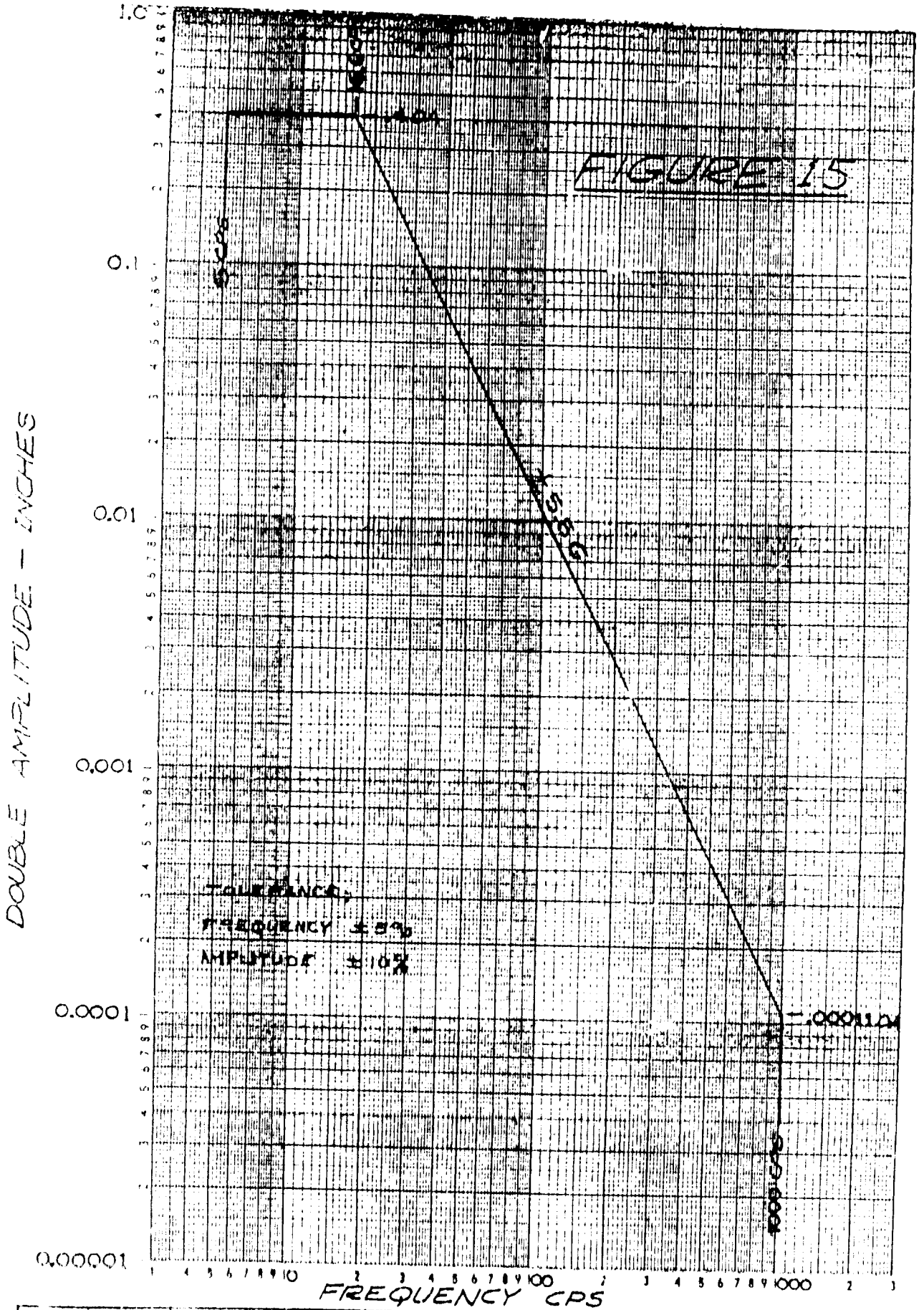


FIG. 14.
TEST DIAGRAM - R.F. SECTION

D10-20402

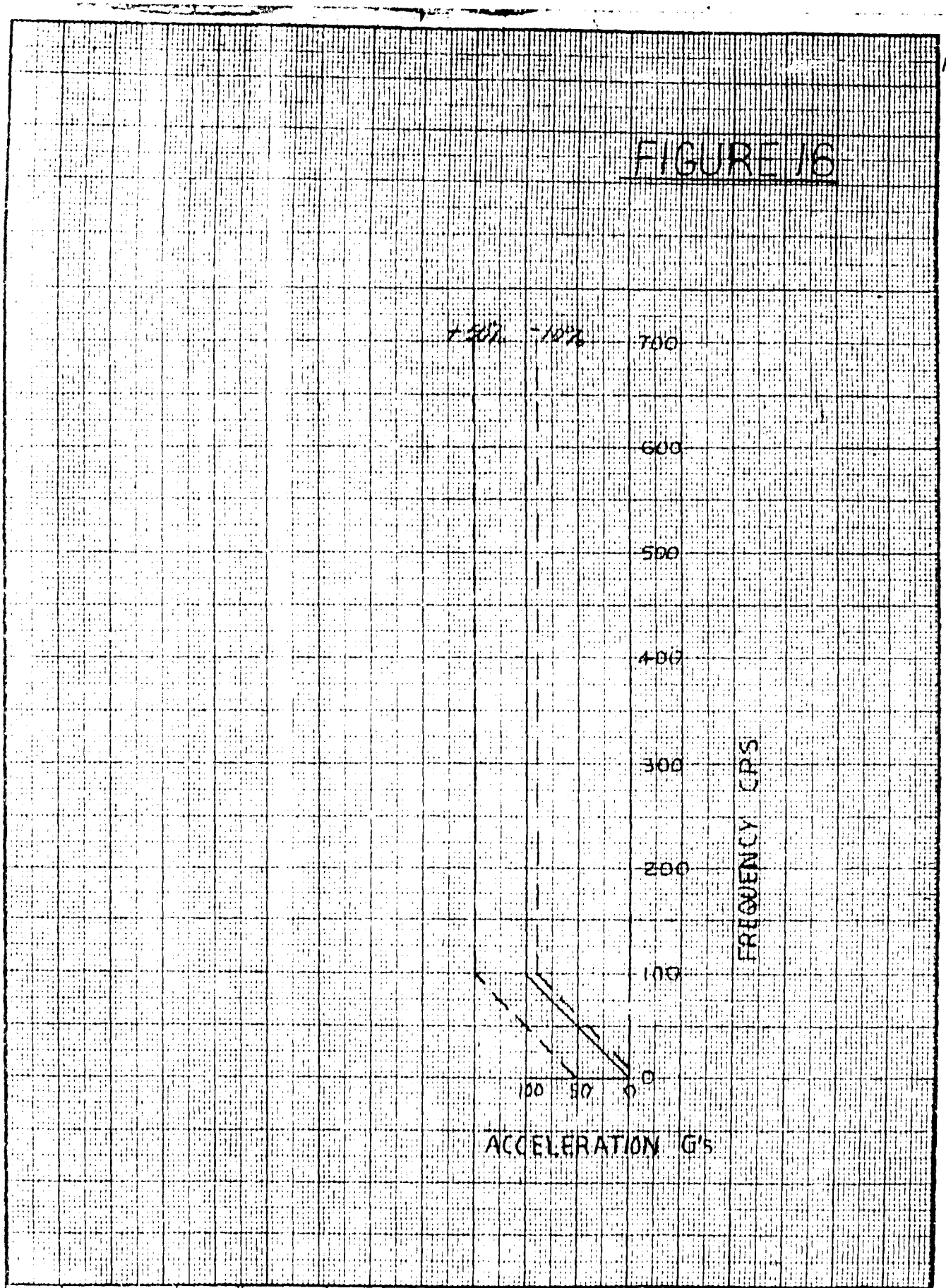
BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON



CALC.	D.W. Mass 5/27/59	REVISED	DATE	SINUSOIDAL VIBRATION ACCEPTANCE TEST ENVELOPE FOR EQUIPMENT OPERATIVE (INTERSTAGES)	SPECIFICATION NO. D10-20402
CHECK					
APPR		G.D. E		BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 157
APPR					

NEW
A

FIGURE 16



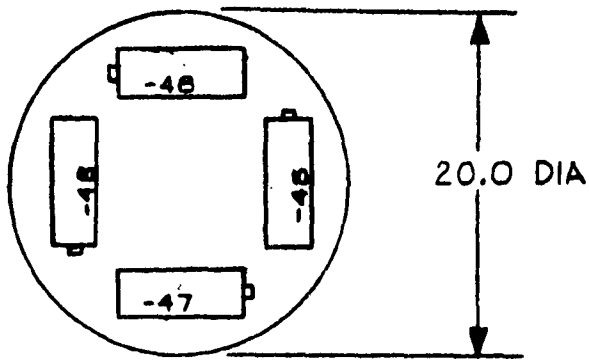
CALC	SPB		REVISED	DATE
CHECK		A	NEW	
APP				
APP				

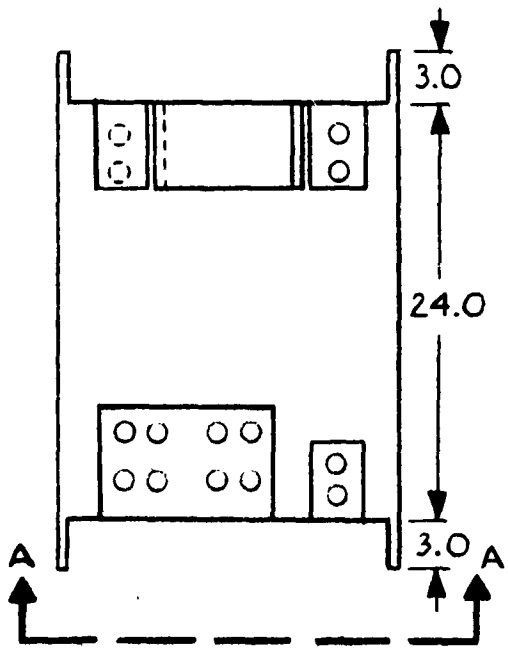
SHOCK TEST SPECTRUM
EQUIPMENT INOPERATIVE

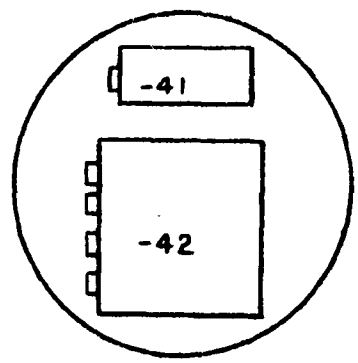
SPECIFICATION NO.
D10-20402

BOEING AIRPLANE COMPANY

FIGURE 17







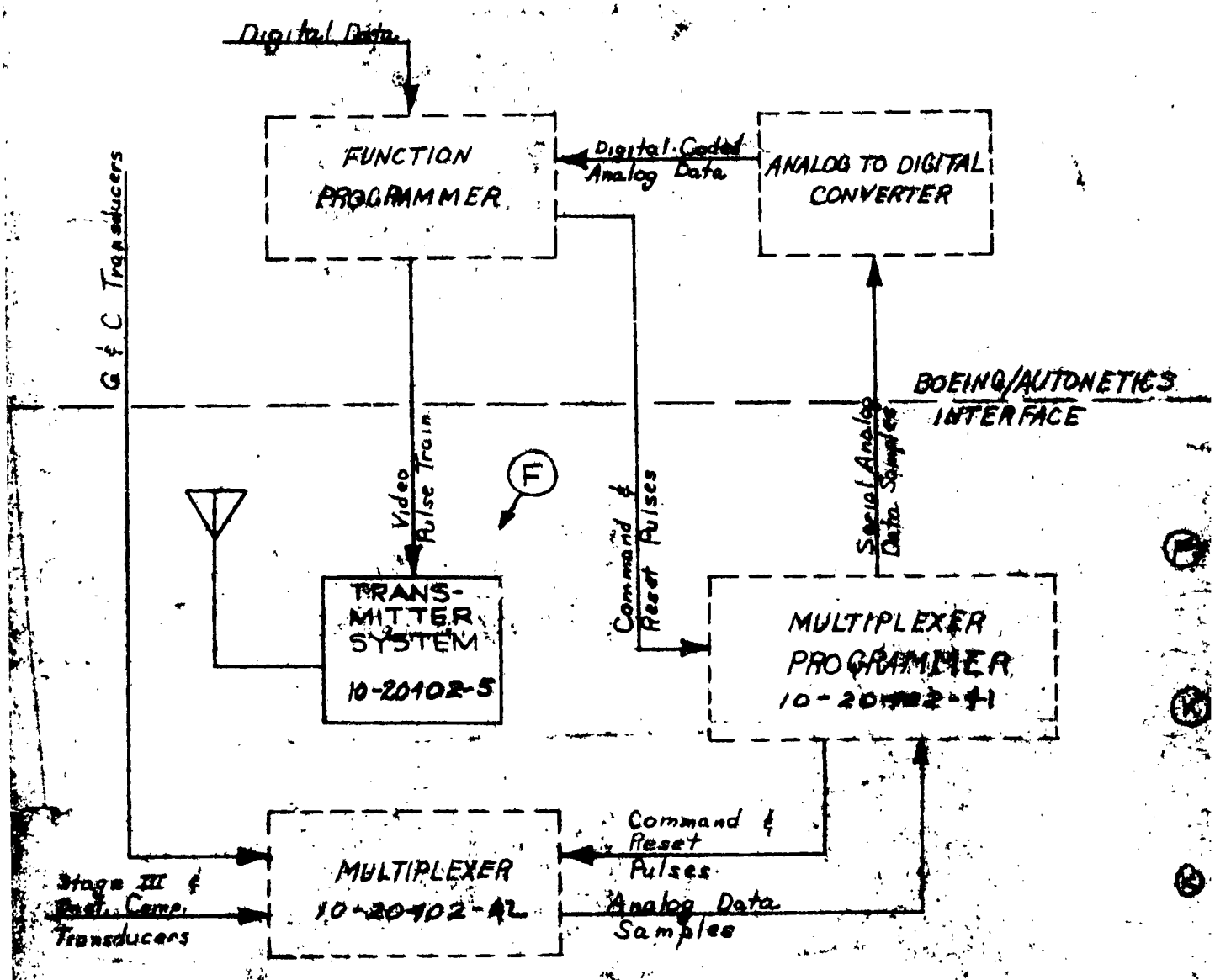
VIEW AA
(ROTATED 90° CCW)

	REVISED	DATE		
CHECK LAH	G	7/25/60	TEMPERATURE - ALTITUDE TEST SET UP	D10-20402
APP. RGW	K	1/4/64		
AUTO.			BOEING AIRPLANE COMPANY	PAGE 159

973 R3

New B

FIGURE 18



CALC			REVISED	DATE	HOLLOMAN AFB PCM/FM TELEMETRY SLED TEST BLOCK DIAGRAM BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON
CHECK			NEW		
APR			F		
APR		LAH	G		
		RFW	K		

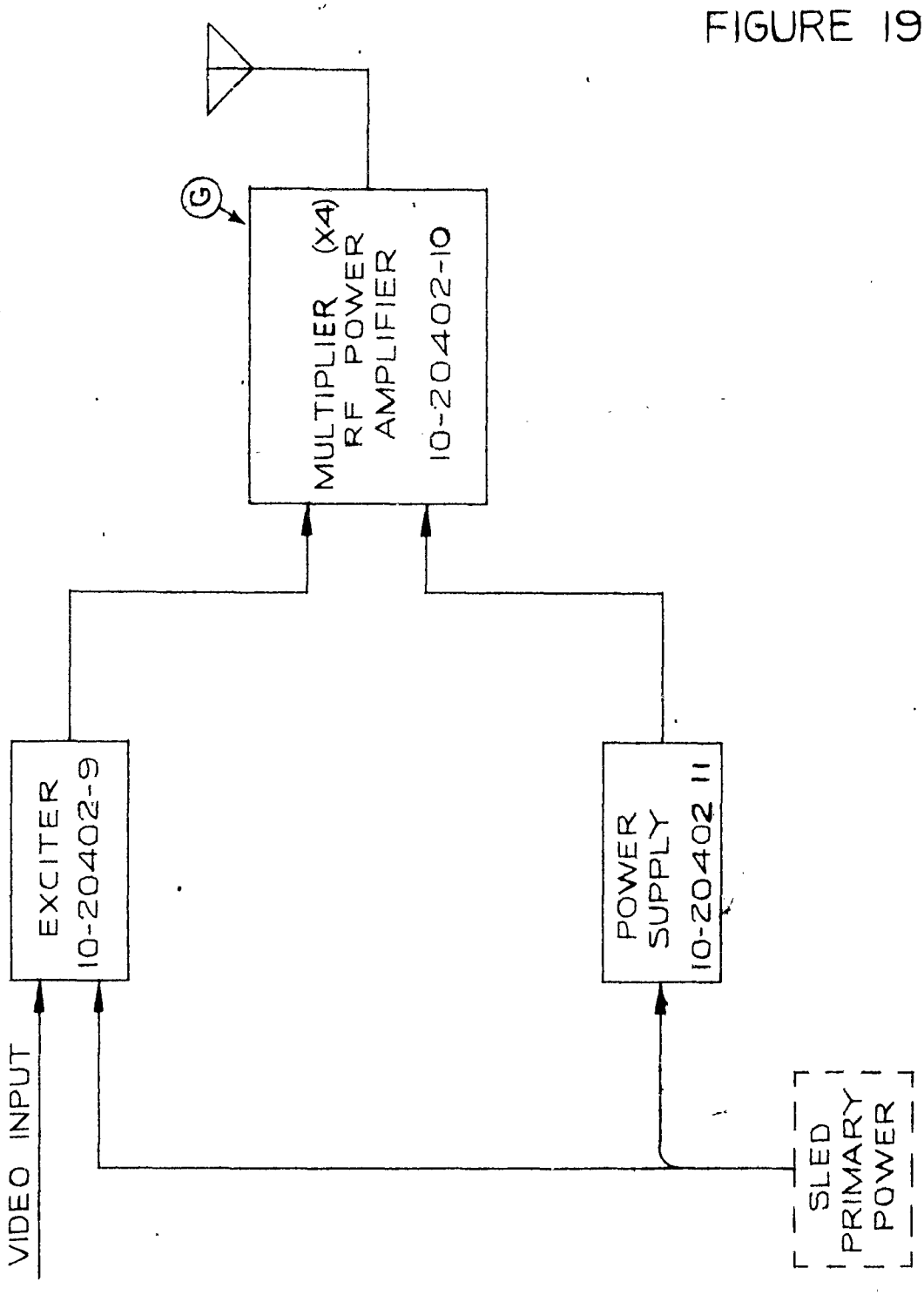
SPECIFICATION NO. D10-20402
PAGE 160

BAC 1017-84

NEW (F)

FIGURE 19

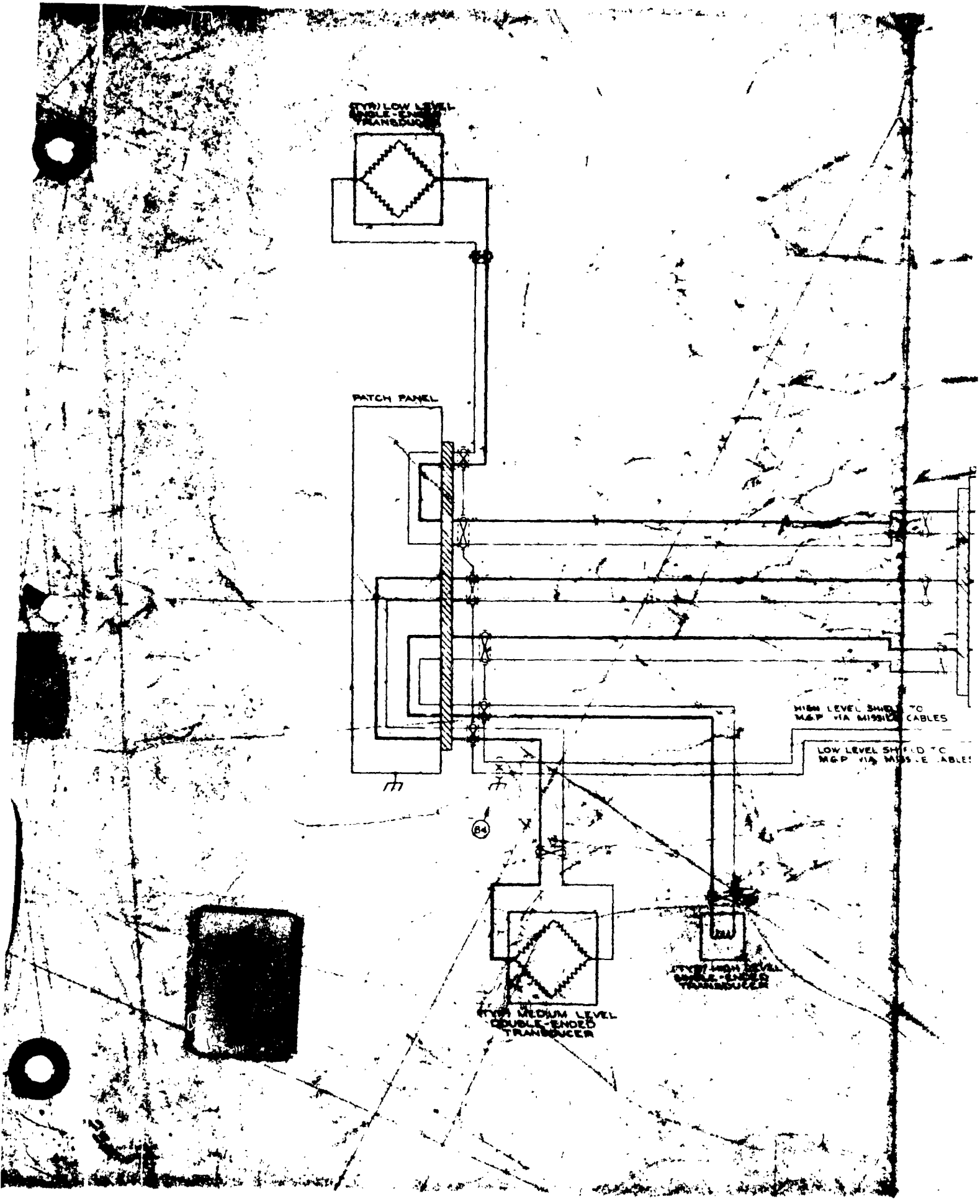
G

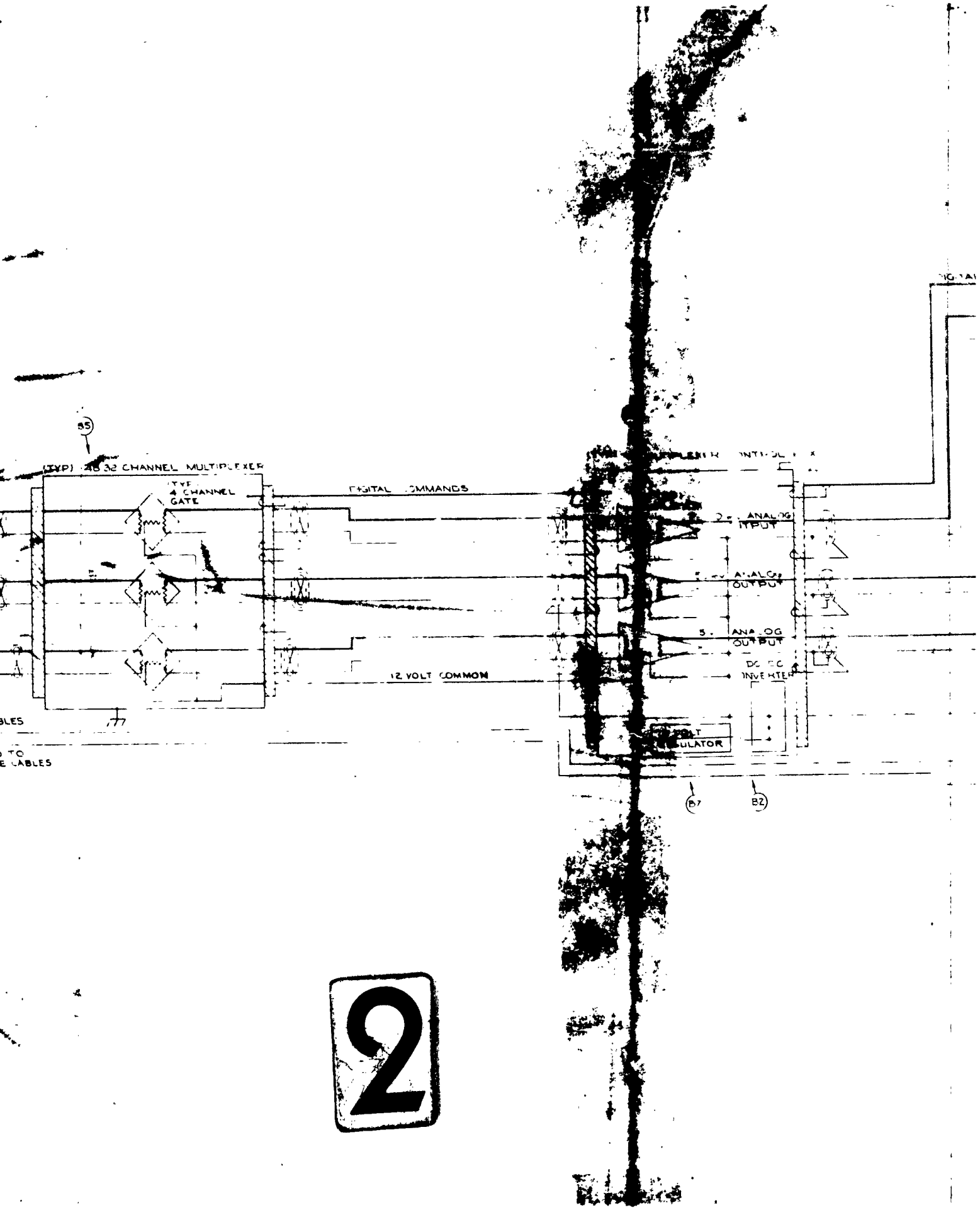


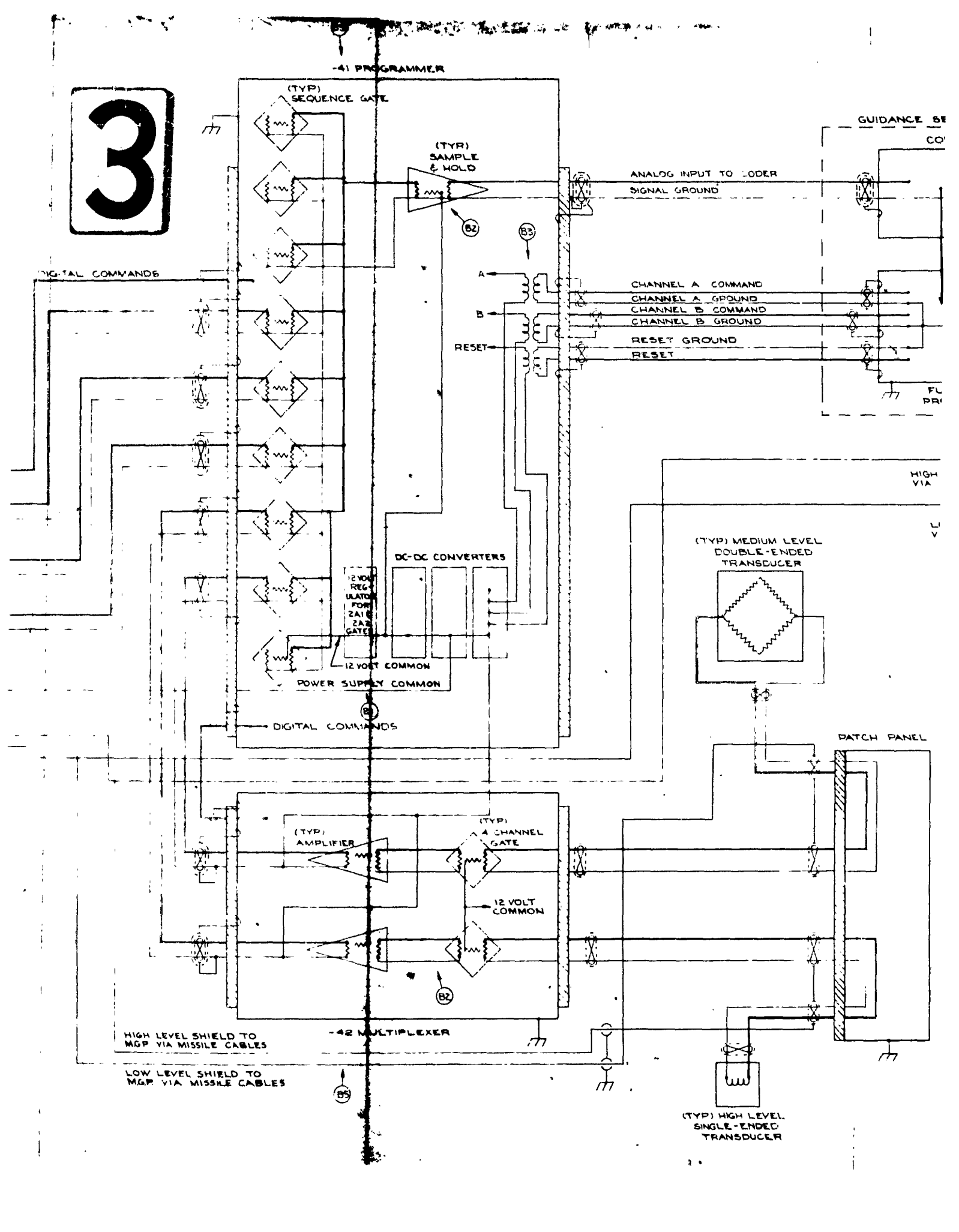
		REVISED	DATE	BLOCK DIAGRAM OF -5 TRANSMITTER SYSTEM	
CHECK	(F) G	R.U. DPT			D10-20402
APR				BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 161

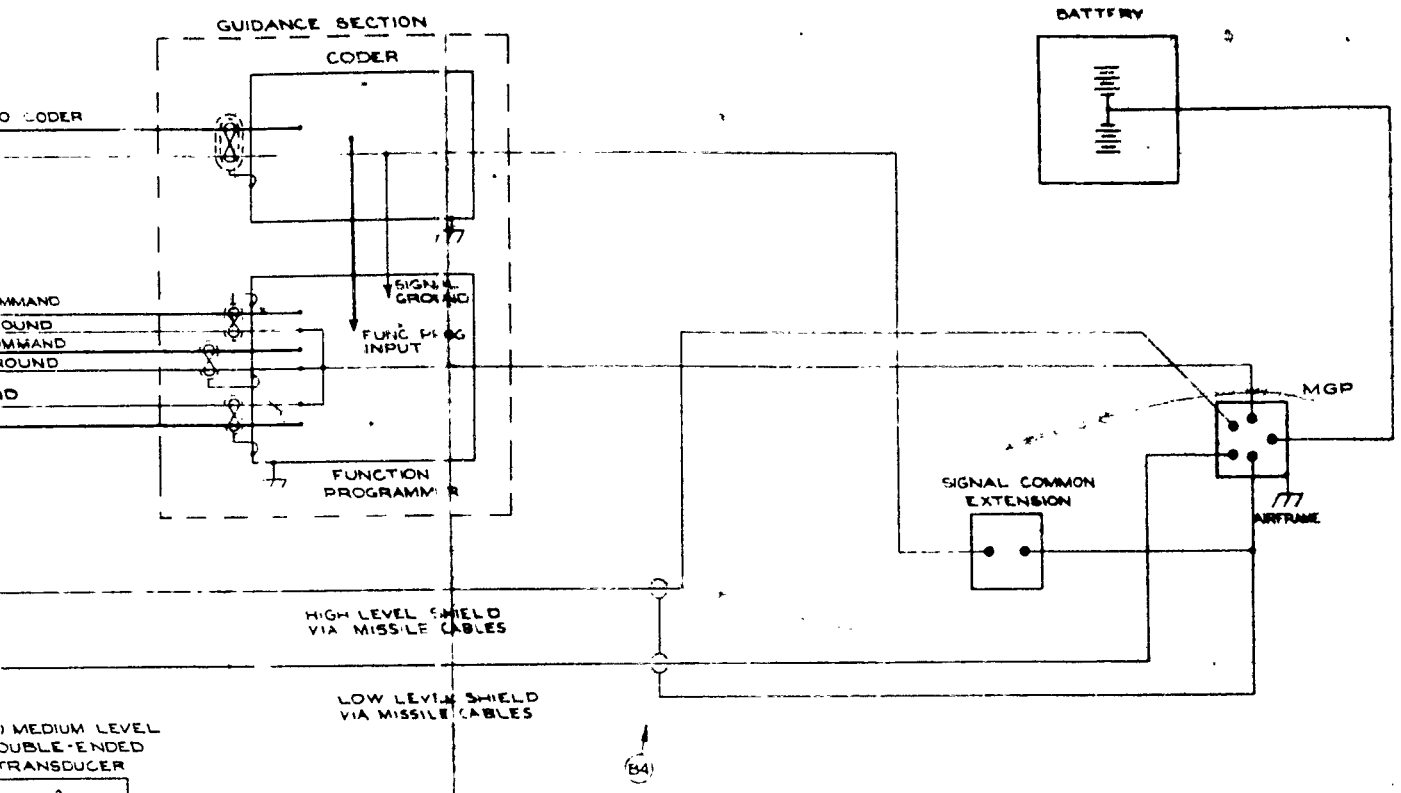
BAC 1017 R4

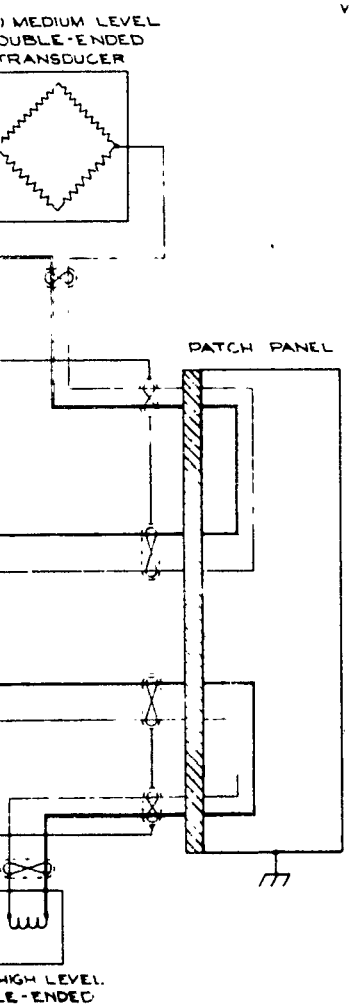
8-7000


PATCH PANEL
HIGH LEVEL SHIELD TO
M&P VIA MISSILE CABLES
LOW LEVEL SHIELD TO
M&P VIA MISSILE CABLES
(84)


B5
(TYP) 48 32 CHANNEL MULTIPLEXER
TYP
4 CHANNEL
GATE
DIGITAL COMMANDS
2. ANALOG
INPUT
ANALOG
OUTPUT
3. ANALOG
OUTPUT
DC TO DC
INVERTER
12 VOLT COMMON
REGULATOR
B7
B2
2


3
-41 PROGRAMMER
(TYP)
SEQUENCE GATE
(TYP)
SAMPLE
& HOLD
ANALOG INPUT TO CODER
SIGNAL GROUND
GUIDANCE SE
CO
DIGITAL COMMANDS
A
B
RESET
CHANNEL A COMMAND
CHANNEL A GROUND
CHANNEL B COMMAND
CHANNEL B GROUND
RESET GROUND
RESET
FL
PR
HIGH
VIA
DC-DC CONVERTERS
12 VOLT REGULATOR FOR 2A1 & 2A2 GATES
12 VOLT COMMON
POWER SUPPLY COMMON
DIGITAL COMMANDS
(TYP) MEDIUM LEVEL
DOUBLE-ENDED
TRANSDUCER
PATCH PANEL
(TYP)
AMPLIFIER
(TYP)
4 CHANNEL
GATE
12 VOLT
COMMON
-42 MULTIPLEXER
HIGH LEVEL SHIELD TO
MGP VIA MISSILE CABLES
LOW LEVEL SHIELD TO
MGP VIA MISSILE CABLES
(TYP) HIGH LEVEL
SINGLE-ENDED
TRANSDUCER





4

CONNECTOR
SIGNAL WIRE
GROUND WIRE
AIRFRAME GROUND

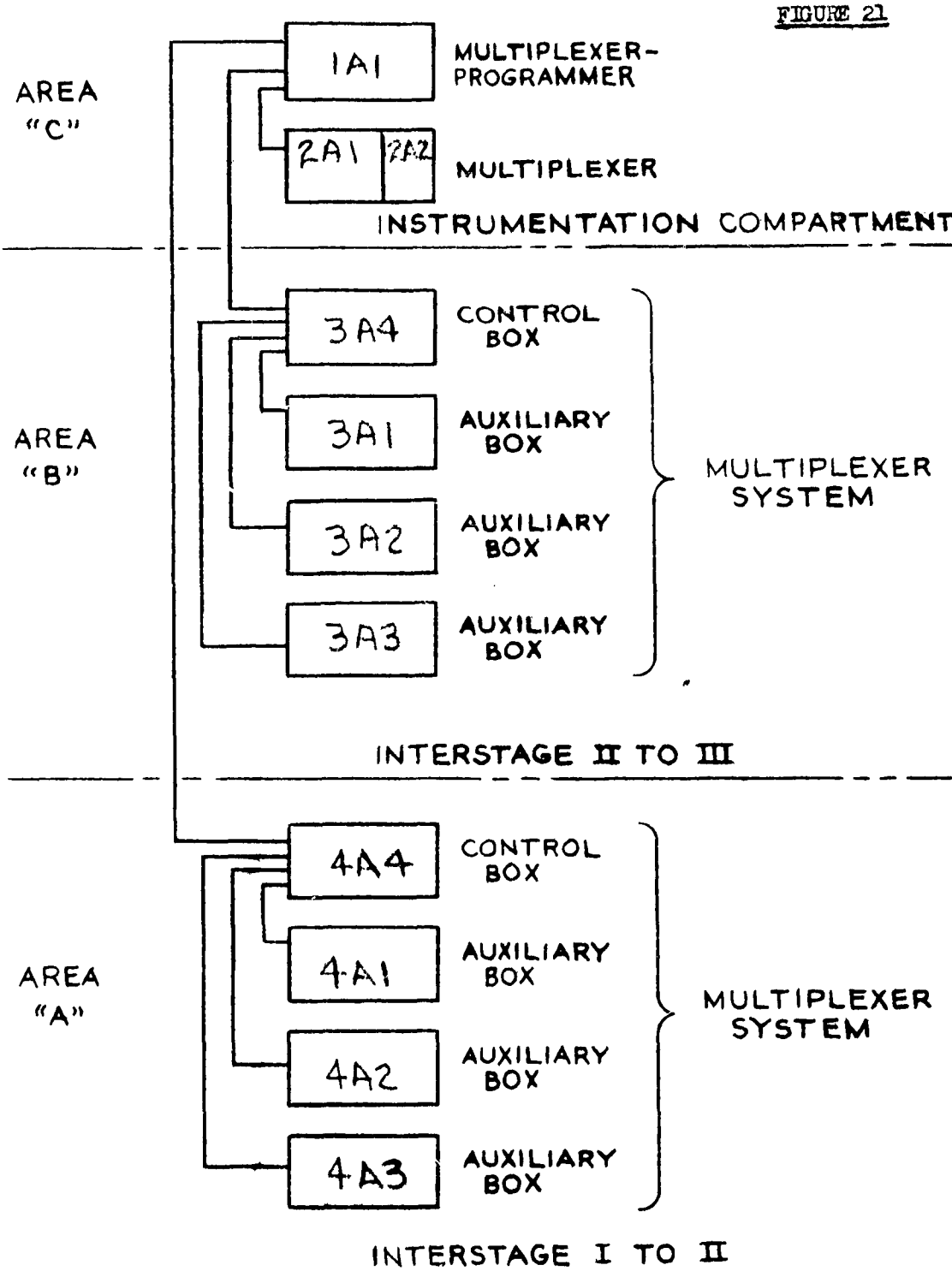
PAGE 162 REV. J

D. TINGWALL 8-18-60

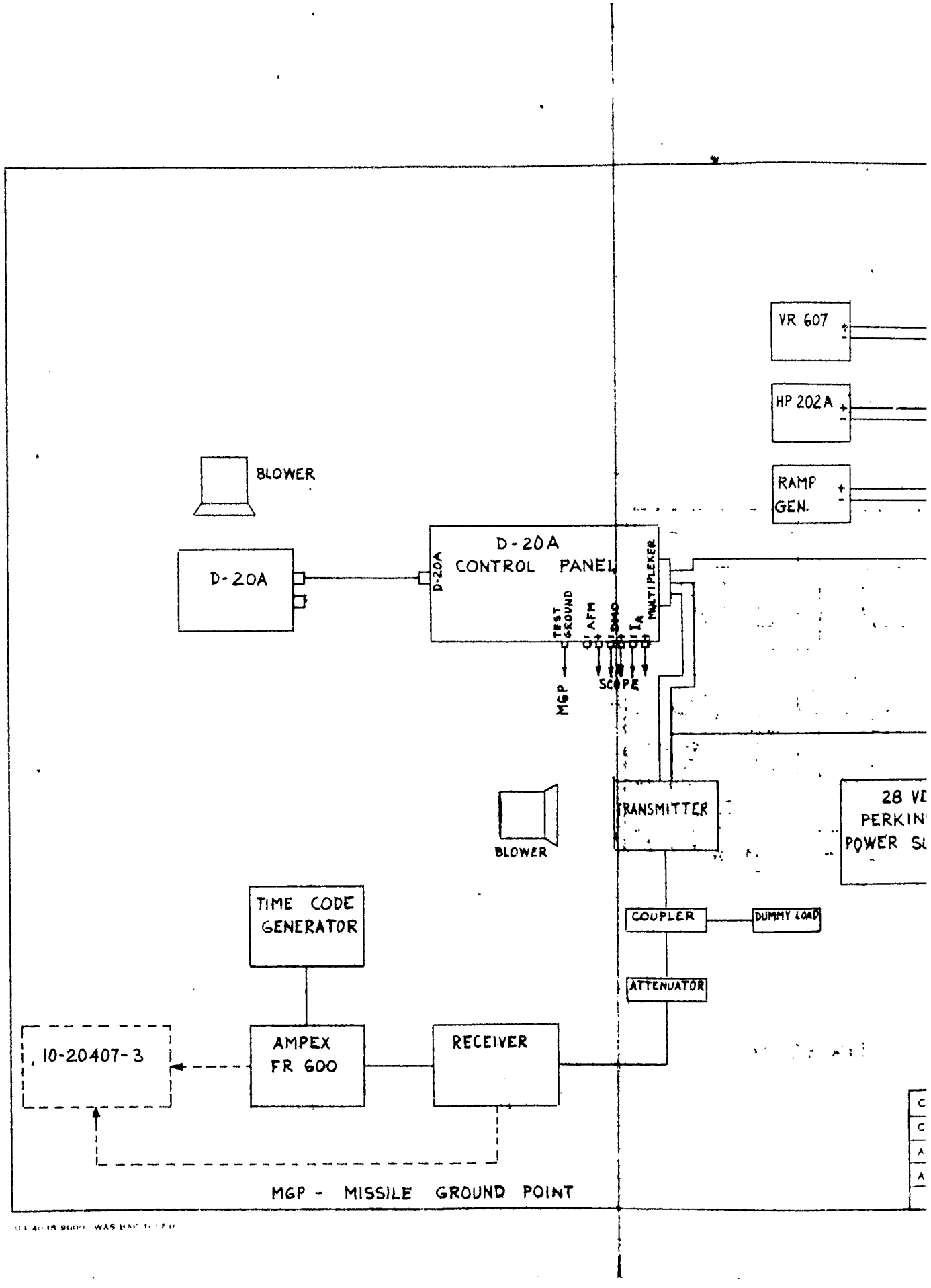
PCM/FM TELEMETRY SYSTEM GROUNDING

BOEING AIRPLANE CO. AERO SPACE DIV.

FIGURE 21



REVISED	DATE	Installation Area Block Diagram - Multiplexer Equipment	D10-20402
G			
R		BOEING AIRPLANE COMPANY	163


VR 607
HP 202A
RAMP GEN.
BLOWER
D-20A
D-20A CONTROL PANEL
D-20A
MULTIPLEXER
TEST GROUND
AFM
DMO
I_A
MGP
SCOPE
BLOWER
TRANSMITTER
28 VD
PERKIN
POWER SU
TIME CODE GENERATOR
COUPLER
DUMMY LOAD
ATTENUATOR
10-20407-3
AMPEX FR 600
RECEIVER
MGP - MISSILE GROUND POINT

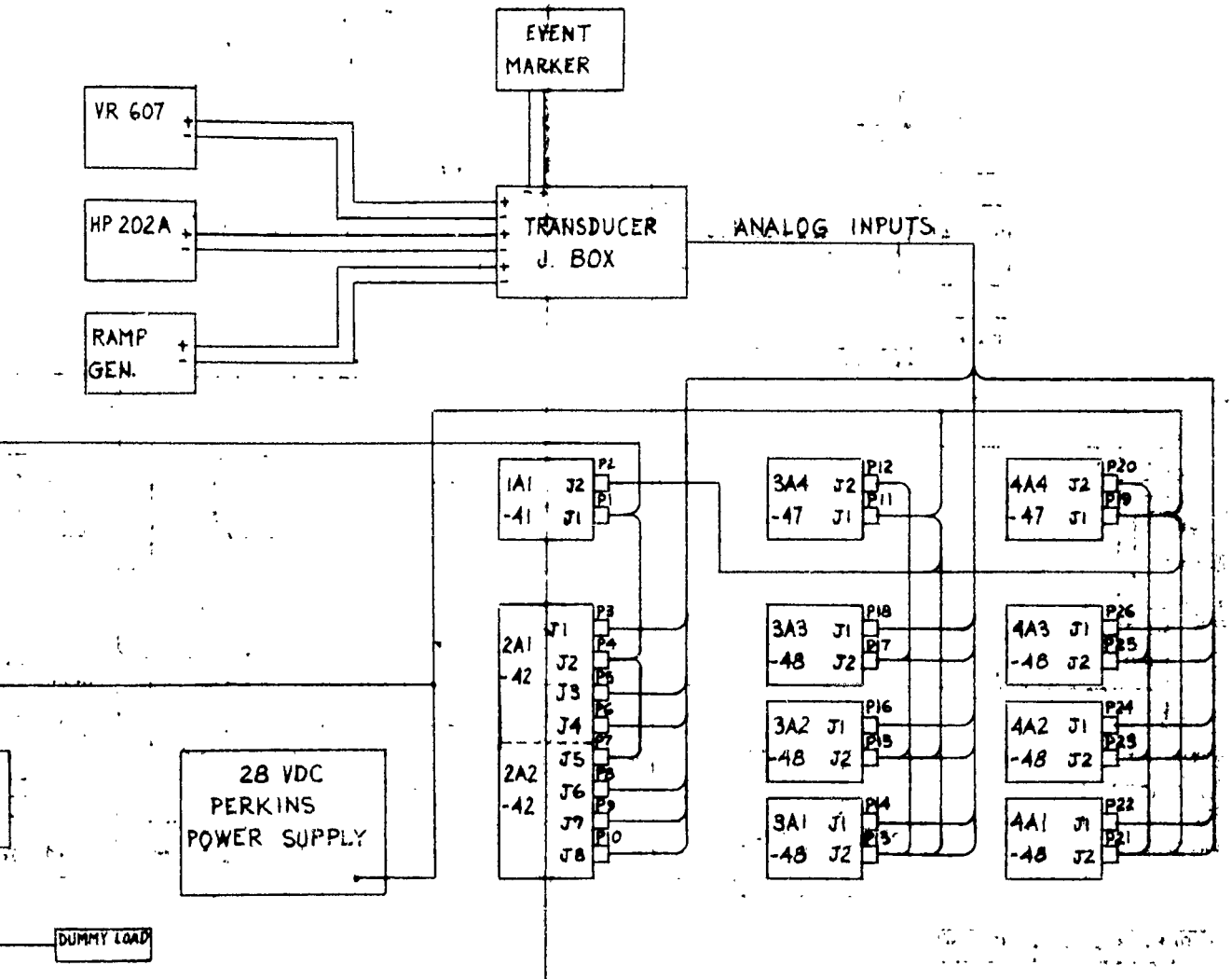
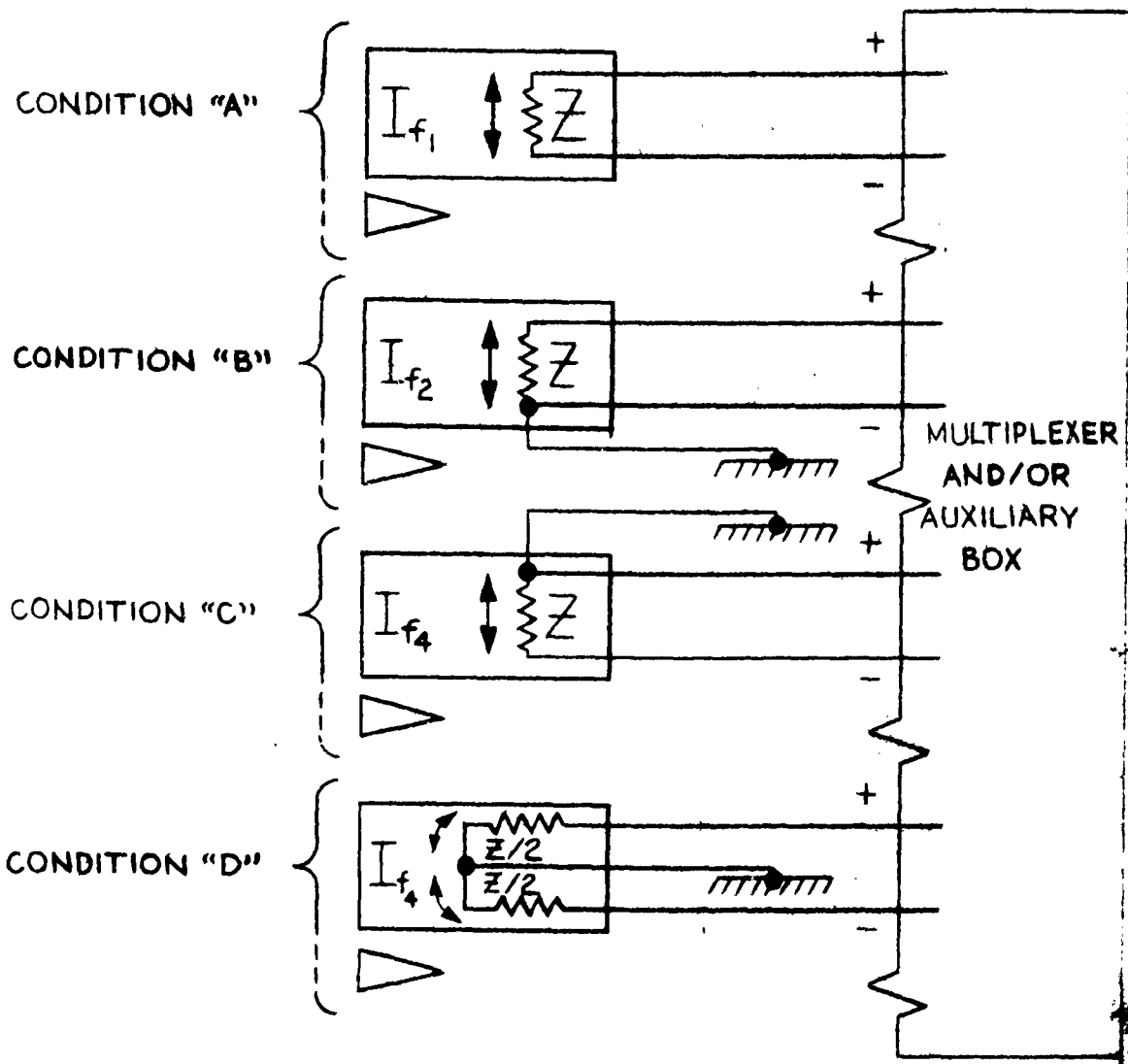


FIGURE 22

CALC		REVISED	DATE	TEST CONFIGURATION DIAGRAM MULTIPLEXER EQUIPMENT PREPRODUCTION TEST	D10-20402
CHECK		G. L. AH	10/25/61		
APR		C.S.M.	10/22/61		
APR				BOEING AIRPLANE COMPANY	PAGE 164

New G



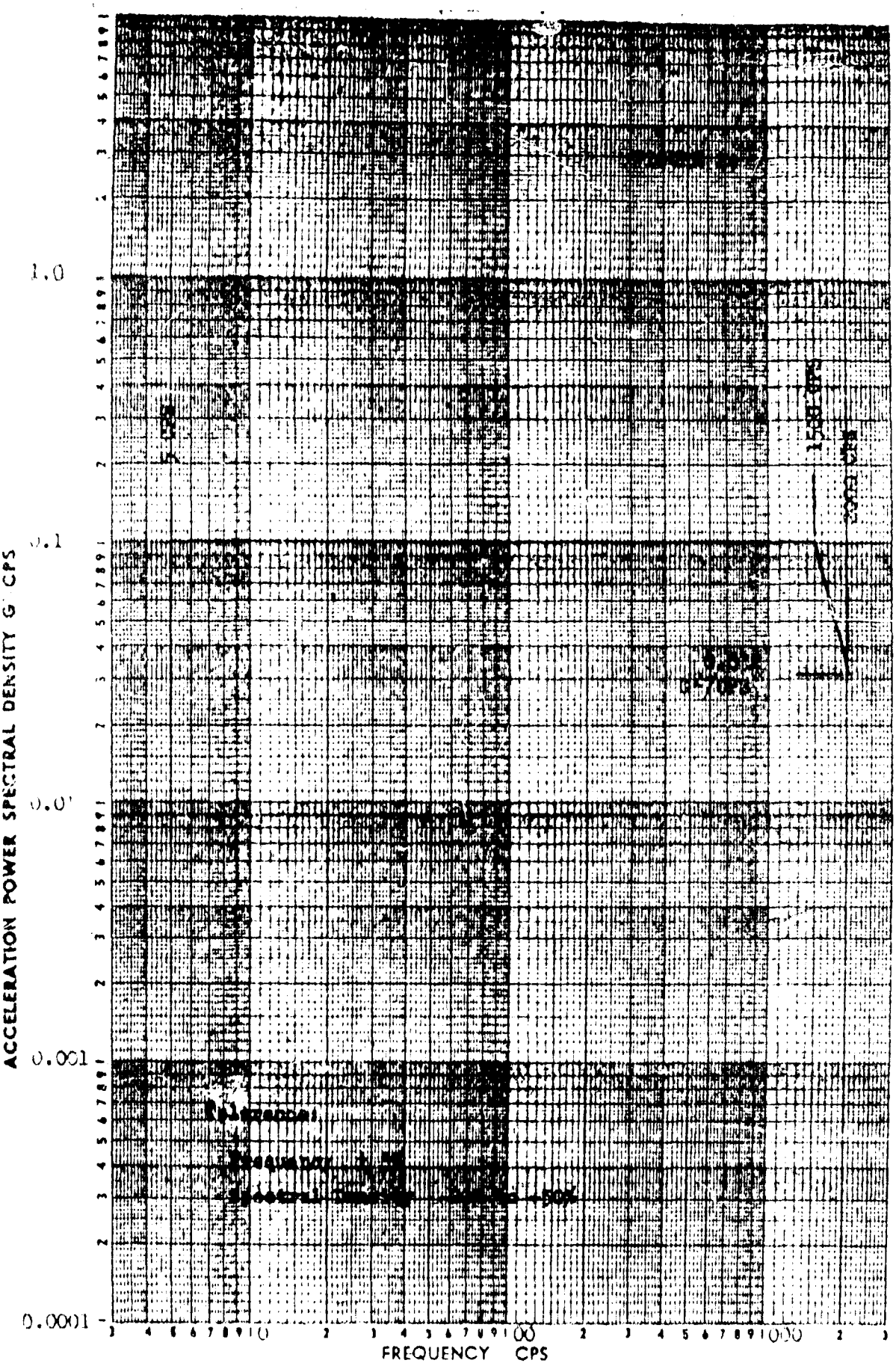
▷ DATA SOURCE

Z = 10 OHMS TO 1000 OHMS

FIGURE 23

I_f = FEEDBACK CURRENT FROM MULTIPLEXER TO DATA SOURCE

	REVISED	DATE		
CHECK	G		Data Source - Multiplexer Current Feedback Configuration	D10-20402
			BOEING AIRPLANE COMPANY	PAGE 165



			REVISED	DATE	RANDOM VIBRATION ENVELOPE FOR EQUIPMENT OPERATIVE (INSTRUMENTATION COMP.)	Spec. No.
CALC						
CHECK				5-3-63		
APPR						DPO 70402
APPR					THE BOEING COMPANY SEATTLE 24, WASHINGTON	PAGE 166